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NEMATODES ON SOYBEAN (GLYCINE MAX)

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Transactions of the Sapporo Natural History Society.
FUJITA, K. & MIURA, O.—“On the parasitism of *Heterodera schachtii* Schmidt on beans.” XIII (3), 359-364. [1934.]

Fujita and Miura describe symptoms of “yellow dwarf,” a disease of Soy beans caused by *H. schachtii* in Japan, and record the results of transmission experiments to determine the host range of the strain involved. Soy bean, adzuki bean, kidney bean and multiflora bean were attacked but 18 other plant species, including the common hosts of most European strains of the parasite, and notably pea, vetch, red clover, cow-pea, peanut, broad bean and lima bean, gave negative results.

M.J.T.

—Proceedings. Association of Southern Agricultural Workers.

TAYLOR, A. L., 1942.—“Root-knot resistance of five soybean varieties.” [Abstract.] 43rd Annual Convention, p. 205.

Tests with five varieties of soybeans in four experiments at three places gave erratic results suggesting that resistance to root-knot varies with ecological conditions. No variety was resistant enough to be useful in a nematode-reducing rotation.

M.T.F.

—Plant Disease Reporter.

HOYMAN, W. G., 1943.—“Resistance of the new non-shattering Armredo soybean to rootknot.” 27 (15), 293-294.

After three months' growth under greenhouse conditions in soil heavily infected with *Heterodera marioni* the new soybean variety Armredo showed moderate infection while Arizona 588 and Arizona 056 were heavily infested. Brabham cowpea, grown under the same conditions, was moderately resistant.

M.T.F.

—Phytopathology.

HOLSTON, E. M. & CRITTENDEN, H. W., 1951.—“Resistance in soybeans to root-knot nematodes.” 41 (6), 562.

The average root-knot indices of the soybean varieties Illini, Lincoln, Dunfield, Hawkeye, Richland, Wabash, Earlyana and Chief, planted in a field infested with *Meloidogyne incognita* var. *acrita* were respectively 5.5, 27.2, 30.9, 38.0, 45.8, 52.8, 55.9 and 61.4. In the greenhouse the averages were Illini 23, Wilson Black 37, Patoka 52, Richland 77, Lincoln 80, Chief 87 and Earlyana 89. Histological examination of roots treated with strong Flemming's solution showed that the apparently resistant Illini variety was as severely affected as the susceptible variety Chief. It is concluded that naked eye examination of gall formation may indicate tolerance not true resistance.

R.T.L.

—Bragantia. Campinas.

ARRUDA, H. V. DE, 1952.—“Análise de uma experiência sobre variedades de soja.” 12 (1/3), 65-73. [English summary pp. 72-73.]

This paper gives the statistical analysis of the results of an experiment to test a number of soya bean varieties for resistance to root-knot eelworms [see No. 636a above]. By using a susceptible check variety in each plot a covariance analysis could be carried out which eliminated the variation correlated with the variation in the check variety, and reduced the error variance by 13%.

M.T.F.

GOMES DA SILVA, J., LORDELLO, L. G. E. & MIYASAKA, S., 1952.—“Observações sobre a resistência de algumas variedades de soja ao nematóide das galhas.” 12 (1/3), 59-63. [English summary p. 62.]

Soya beans in Brazil are severely attacked by two forms of root-knot nematodes both closely related to *Meloidogyne incognita* (Kofoid & White, 1919) Chitwood, 1949. The authors give the results of testing 21 soya bean varieties for resistance to these forms. The variety N46-2652, which is considered to be resistant in the southern parts of the U.S.A., was susceptible in two pot tests. The varieties Palmeto and La 41-1219 were resistant in a field trial and in two pot tests, while N45-3799 and Ootootan were resistant in a single field trial.

M.T.F.

Oyo-Dobutsugaku-Zasshi (Magazine of Applied Zoology). Tokyo.

ICHINOHE, M., 1952.—“On the soy bean nematode, *Heterodera glycines* n.sp., from Japan.” 17 (1/2), Reprint 4 pp.

Ichinohe describes *Heterodera glycines* n.sp. from Japan and Manchuria. It is a species with lemon-shaped cysts 0.69 mm. by 0.49 mm. and has been found parasitizing only *Glycine max*, *Phaseolus angularis* and *P. vulgaris*. The larvae are $484 \pm 21.3 \mu$ long, the males 1.3 mm. with a stout stylet 26.8 μ long and bifid-tipped spicules. The females have a pale yellow phase on turning from white to brown and the cyst wall has characteristic punctations described as coarse and conspicuous with a tendency to run in parallel rows.

M.T.F.

Using the relative index system of Smith & Taylor (1947) to assess the damage caused to 14 varieties of soya bean by *Heterodera schachtii* [now *H. glycines* Ichinohe], Mukasa & Ichinohe found that the system could be applied to this nematode and found statistically significant differences in susceptibility, ranging from a disease index of 9.1 to one of 72. M.T.F.

—Phytopathology

CRITTENDEN, H. W., 1953.—“Effect of clean fallow in root knot development on soybeans.” 43 (7), 405.

In field experiments on a loamy sand in Delaware with soya beans, root-knot nematodes in the top six inches of soil were greatly reduced when the land was kept in clean fallow by cultivation once a fortnight from 1st May until time of planting. R.T.L.

822—Journal of the Kanto-Tosan Agricultural Experiment Station.

FUKUI, J., YARIMIZU, H., IIZIMA, K., TANAKA, T. & IZUMI, S., 1953.—[Control of the nematode (*Heterodera marioni* (Cornu) Goodey) on soy-bean. I. Effect of DD (dichloropropane-dichloropropylene) as worm killer.] No. 4, pp. 19–22. [In Japanese: English summary p. 22.]

FUKUI, J. & YARIMIZU, H., 1953.—[Control of the nematode (*Heterodera marioni* (Cornu) Goodey) on soy-bean. II. Residual effectiveness of DD (dichloropropane-dichloropropylene) application.] No. 4, pp. 23–26. [In Japanese: English summary p. 26.]

D-D mixture and chloropicrin were tested for the control of root-knot eelworms attacking soya beans in pleistocene soil. D-D proved very effective when injected at 3 c.c. per sq. ft. and less so at 3 c.c. per 4 sq. ft. Chloropicrin was inferior to D-D. M.T.F.

Following up the work reported in the previous paper [see abstract No. 822a above] it is recorded that there was a good residual effect of D-D mixture the next year but not in the second year after application, except in the early stages of plant growth. Chloropicrin had less residual effect than D-D. D-D is considered very expensive for practical use by farmers. M.T.F.

—Revista do Instituto Adolfo Lutz. São Paulo.

CARVALHO, J. C., 1954.—“A soja e seus inimigos do solo.” 14 (1), 45–52. [English summary p. 50.]

Four species of root-knot nematode have been found attacking soya beans in São Paulo. They are identified as *Meloidogyne javanica*, *M. arenaria*, *M. incognita* and *M. hapla*. The soya bean variety La 41-1219, which is considered to be susceptible in the southern U.S.A., was slightly resistant to *M. arenaria* in Campinas. The variety Abura was badly attacked by *M. javanica*, *M. arenaria* and *M. incognita* in different districts. In Terra Roxa, soya beans were attacked by *M. hapla*. M.T.F.

—Phytopathology

CRITTENDEN, H. W., 1954.—“Factors associated with root-knot nematode resistance in soybeans.” [Abstract of paper presented at the 11th Annual Meeting of the Potomac Division of the American Phytopathological Society, Beltsville, Md., March 4–5, 1954.] 44 (7), 388.

The following morphological and physiological features of soya bean varieties are associated with their resistance to *Meloidogyne incognita* var. *acrita*: (i) long tapering roots penetrating deep into the soil and possessing a minimum of laterals; (ii) roots that become woody early; (iii) acceptable growth and yield in soils with low potassium content; (iv) seeds with lowest percentage of oil commercially acceptable. The variety Laredo showed the greatest resistance but in Delaware is suitable only for hay or a green manure crop. The commercial varieties (Blackhawk, Monroe and Anderson) have a high degree of resistance and are acceptable in Delaware for seed production. G.I.P.

CRITTENDEN, H. W., 1955.—“Root knot nematode resistance of soybeans.” 45 (6), 347.

Crittenden found high resistance to *Meloidogyne incognita* var. *acrita* in 10 out of 50 soya bean varieties tested, namely, Laredo, Mukden, Anderson, Monroe, Blackhawk, Peking, Mendota, Haberlandt, Habaro and Mandarin. These include representatives from all maturity groups. The first five were also tested against *M. hapla* and all were susceptible. It is emphasized that the growing of a crop resistant to *M. incognita* var. *acrita* may selectively increase *M. hapla* and it is therefore necessary to identify the species of *Meloidogyne* present if crop rotations are to be used for control. M.T.F.

-Japanese Journal of Ecology.

ICHINOHE, M., 1955.—[Survey on the 'yellow dwarf' disease of soy bean plant caused by *Heterodera glycines* occurring in the peat soil in Hokkaido.] 5 (1), 23-26. [In Japanese: English summary p. 23.]

"Yellow dwarf" disease of soya beans due to *Heterodera glycines* has been commonly found in volcanic ash soil in Hokkaido. In 1954 it was found in three patches in a field of peat soil where it was thought that the nematodes had increased in a clayey loam rich in humus with which the peat soil had been mulched.

M.T.F.

-Report of the Hokkaido National Agricultural Experiment Station.

ICHINOHE, M., 1955.—[Studies on the morphology and ecology of the soy bean nematode, *Heterodera glycines*, in Japan.] No. 48, 64 pp. [In Japanese: English summary pp. 59-64.]

Ichinohe gives a detailed description of all stages of *Heterodera glycines* as found on soya beans in Japan. Observations on the life-cycle indicate that a maximum of three generations may be completed in one season. Experiments on hatching responses to root diffusates gave negative results. Cysts exposed to a temperature of -40°C. for seven months still contain viable eggs. *Glycine ussuriensis* is a new host record. The author also describes *Heterodera major* found on wheat at two places and records *Digitaria ciliaris* [= *D. sanguinalis*] as a new host of this species.

M.T.F.

-Research Bulletin of the Hokkaido National Agricultural Experiment Station.

ICHINOHE, M., 1955.—[A study on the population of the soy bean nematodes (*Heterodera glycines*). 1. An observation on the relation between the crop damage and the female infestation.] No. 68, pp. 67-70. [In Japanese: English summary p. 70.]

Using the number of pods per plant as a criterion of crop damage in soya beans, Ichinohe showed that in general there were fewer female *Heterodera glycines* on heavily damaged and on lightly damaged plants than on soya bean showing medium damage. He gives a table showing the pods per plant, the seed yield, the height of plants, the number of females per plant and the frequency in different categories of plant damage.

J.B.G.

-Plant Disease Reporter.

LORDELLO, L. G. E., 1955.—"Nematodes attacking soybean in Brazil." 39 (4), 310-311.

The soya bean variety La 41-1219 is attacked by *Meloidogyne incognita* but not by a closely related species, to be described as a new species elsewhere. La 41-1219 was not attacked by an undescribed subspecies of *M. javanica* although variety Abura was. Large galls on soya bean roots were produced by all three species.

J.B.G.

-SPEARS, J. F., 1955.—"Progress report of soybean cyst nematode control program for calendar year 1955." Hicksville, N.Y.: U.S. Department of Agriculture, Agricultural Research Service, Plant Pest Control Branch, 25 pp. [Marked "administratively confidential".]

-Plant Disease Reporter.

WINSTEAD, N. N., SKOTLAND, C. B. & SASSER, J. N., 1955.—"Soybean cyst nematode in North Carolina." 39 (1), 9-11.

A species of *Heterodera* is reported attacking and seriously damaging soya beans (*Glycine max*) in south-eastern North Carolina. It is tentatively identified as *H. glycines*. There were several thousand cysts per pint of soil.

M.T.F.

-ANON., 1956.—"Soybean cyst nematode." Washington, D.C.: U.S. Department of Agriculture, Agricultural Research Service, ARS 22-29, 10 pp.

This is a special report giving details of the discovery and distribution of the soya bean cyst nematode in America. There is a detailed description of the nematode and its life-history, and an account of current research on the pest.

J.J.H.

-Research Bulletin of the Hokkaido National Agricultural Experiment Station.

ICHINOHE, M. & ASAI, K., 1956.—[Studies on the resistance of soybean plants to the nematode, *Heterodera glycines*. 1. Varieties 'Daiichi-hienuki' and 'Nangun-takedate'.] No. 71, pp. 67-79. [In Japanese: English summary p. 79.]

Two resistant and two susceptible varieties of soya beans were tested in soils equally inoculated with *Heterodera glycines*. The resistant varieties, "Daiichi-hienuki" and "Nangun-takedate" showed no stunting or reduced yield, whereas the susceptible varieties, "Kokusô" and "Tokachi-nagaha", suffered severe disease symptoms and yield reduction. Resistance took the form of failure of the majority of within-host larvae to survive. The root systems of the resistant plants were large with a higher density of root nodules than occurred on the susceptible varieties, though most plants grown in infested soil had fewer root nodules than normal.

C.C.D.

Three nematodes have been found damaging soya beans in the State of São Paulo, Brazil, namely *Pratylenchus* sp., *Meloidogyne incognita* and *M. javanica bauruensis* n. subsp. The new subspecies is described and figured. It differs from *M. javanica* in having broader eggs, a slightly longer stylet and a longer oesophagus in proportion to the total length in the larva, a single post-labial annule in the male and differences in the perineal pattern which has a high arch with wavy to zigzag striae and the lateral lines less well marked than in *M. javanica*. Male intersexes occurred having female characters in more or less marked degree. Measurements are given of the population of *M. incognita* which differ from that described by Chitwood in having shorter and more slender larvae and shorter spicules. This species attacked only the soya bean variety La41-1219 and *M. javanica bauruensis* only the variety Abura.

M.T.F.

—Revista Brasileira de Biologia.

LORDELLO, L. G. E., 1956.—“*Meloidogyne inornata* sp.n., a serious pest of soybean in the State of São Paulo, Brazil (Nematoda, Heteroderidae).” 16 (1), 65-70.

A new species, *Meloidogyne inornata*, is described from the Campinas region of São Paulo, Brazil. It attacks some soya bean varieties, but the variety La 41-1219 is resistant. It closely resembles *M. incognita* but differs in usually having wider eggs (37.5-60 μ as compared with 30-38 μ), the head of the pre-parasitic larva and of the male has only one wide post-labial annule instead of three, and the excretory pore in the female is further back, between the 17th and 22nd annule from the head. *M. incognita* also differs in that it does attack La 41-1219. The perineal pattern of *M. inornata* may be confused with that sometimes found in *M. incognita* and therefore provides an example of a species which cannot be identified by this character alone.

M.T.F.

—Plant Disease Reporter.

MANKAU, G. R. & LINFORD, M. B., 1956.—“Soybean varieties tested as hosts of the clover cyst nematode.” 40 (1), 39-42.

Mankau & Linford grew 27 varieties of soya bean for five to six weeks in soil heavily infested with *Heterodera schachtii* var. *trifolii* from Illinois. The roots were then carefully examined for cysts and, by a staining and clearing technique, for larvae. The larvae apparently entered the roots of all varieties freely but in 19 there was no further development. In six varieties there were a very few, poorly developed females containing no eggs, while in the varieties Earlyana and Dunfield there were small numbers of females and young cysts with eggs and many more females which had failed to develop. There were no eggs deposited in egg sacs. Many larvae were found in the soil in which the plants had been growing. None of these varieties can thus be regarded as a suitable host for the Illinois population of clover cyst nematodes.

M.T.F.

—Phytopathology (cont.)

SKOTLAND, C. B., 1956.—“Life history and host range of the soybean cyst nematode.” 46 (1), 27.

When roots of soya bean seedlings were inoculated with second-stage larvae of *Heterodera glycines* mature males were found 14 days and second generation larvae 21 days later. This suggests that five generations could be produced on a soya bean crop in one season in North Carolina. In green-house studies on host range 39 plant species were inoculated but reproduction occurred only in *Glycine max*, *G. ussuriensis*, *Phaseolus vulgaris*, *P. angularis* and on two new hosts, viz., *Lespedeza stipulaceae* and *Vicia sativa*.

R.T.L.

—Extension Folder. North Carolina State College of Agriculture.

SKOTLAND, C. B., WINSTEAD, N. N. & SASSER, J. N., 1956.—“The soybean cyst nematode disease.” No. 126, 5 pp.

Heterodera glycines has been found in North Carolina where it causes soya beans to be stunted and to yellow prematurely. Other susceptible crops are snap beans, vetch and annual lespedeza. Recommendations for control include the growing of non-susceptible crops, care in preventing spread of infected soil, and chemical treatment of gladiolus corms and daffodil bulbs to prevent spread on them.

J.B.G.

—Plant Disease Reporter.

SPEARS, J. F., BOWEN, F. I. & BOWERS, C. D., 1956.—“Soybean cyst nematode found in new area.” 40 (9), 830.

Heterodera glycines has been recorded on a property 19 miles north of the area of extensive infestations at Wrightsboro, North Carolina. A third centre of infestation is at Castle Hayne, five miles north of Wrightsboro. Between these centres no infestation has been found after extensive soil sampling.

M.T.F.

WHITEHEAD, M. D., MATSON, A. & WILLIAMS, L., 1956.—“Severe root-knot nematode infection of the soybean variety Lee.” 40 (3), 176.

Although the soya bean variety Lee is considered to have relatively high resistance to various diseases, including infection by *Meloidogyne incognita*, it was found to be severely infected with *M. arenaria* in a soya bean nursery at Hornersville, Dunklin County, Missouri.

R.T.L.

—Phytopathology.

WINSTEAD, N. N. & SKOTLAND, C. B., 1956.—“Eradicant treatments for narcissus bulbs and gladiolus corms harboring soybean nematode cysts.” 46 (1), 31.

Heterodera glycines has so far been found in only a small area in south-eastern North Carolina. As soya beans are often grown there in rotation with gladiolus and narcissus the cysts might be disseminated by corms and bulbs. A non-phytotoxic treatment to kill unhatched larvae in cysts was therefore sought. It was found that 0.5% formalin at 45°C. for three or four hours and hot water at 48°C. for thirty minutes killed unhatched larvae. A thirty-minute pre-storage steep of the corms and bulbs, when harvested, in Dowcide B (85% sodium 2, 4, 5-trichlorophenoxide) 3-100 killed the unhatched larvae and gave effective control of Fusarium rot.

R.T.L.

—ANON., 1957.—“The soybean cyst nematode: a new pest.” Washington, D.C.: U.S. Department of Agriculture, Agricultural Research Service, PA-333, 4 pp.

This is a four-page illustrated pamphlet giving a description and details of the soya bean cyst nematode (*Heterodera glycines* Ichinohe) and its life-history. The pamphlet includes paragraphs on control of the nematode.

J.J.H.

—Phytopathology.

ENDO, B. Y. & SASSER, J. N., 1957.—“The effectiveness of various soil fumigants for control of the soybean cyst nematode.” 47 (1), 9.

Endo & Sasser have tested the following soil fumigants for control of *Heterodera glycines*: D-D mixture (at 20, 40 and 60 gal. per acre), Dowfume W-85 (at 4½, 9 and 13½ gal. per acre), methyl bromide (at 1, 2 and 3 lb. per 100 sq. ft.), Nemagon (at 3 and 5 gal. per acre) and Telone (at 20 and 40 gal. per acre). All were applied four weeks before seeding. No larvae were recovered from the plots one month after treatment with methyl bromide, D-D (at 40 or 60 gal. per acre) or Telone (at 40 gal. per acre) and, although viable eelworms were later recovered from these plots the numbers were much smaller than in the control plots. All treatments but W-85 (at 13½ gal. per acre) and Telone (at 20 gal. per acre) resulted in significantly lower white cyst counts than the controls. There appeared to be an inverse correlation between high cyst counts and nitrogen nodule formation.

S.W.

—Plant Disease Reporter.

EPPS, J. M., 1957.—“Soybean cyst nematode found in Tennessee.” 41 (1), 33.

The soya bean cyst nematode *Heterodera glycines* has been found in Lake County, U.S.A. on roots of soya beans. The infestation covers a considerable acreage and the nematode was found in soil varying from very sandy to heavy.

J.J.H.

HEGGÉ, A. H., 1957.—“Soybean cyst nematode in Missouri.” 41 (3), 201.

The soya bean cyst nematode *Heterodera glycines* Ichinohe was found in Pemiscott County and Lake County in the State of Missouri.

J.J.H.

—Nematologica.

LORDELLO, L. G. E., 1957.—“Two new nematodes found associated with soy-bean roots.” 2 (1), 19-24. [Portuguese summary pp. 23-24.]

Lordello describes *Carcharolaimus formosus* n.sp. found around decaying soya bean roots. It has a dentate labial structure and differs from the other two species of the genus (*C. dentatus* and *C. pizai*) with this character in having a broader labial region and in the presence of pores along the ventral and lateral fields. It differs from *C. dentatus* also in the position of the vulva which is at 57.4% as compared with 48% in *C. dentatus* and in the absence of glandular bodies at the base of the oesophagus. From *C. pizai* it differs in being longer and slender (2,337 μ long and 50 μ wide as compared with 1,635 μ and 65 μ). No males were found. A key to the species of *Carcharolaimus* is given. A single female, also found round galled soya bean roots, is described and named *Dorylaimus bauruensis* n.sp. It is unlike any other described species of *Dorylaimus*, the outstanding feature being a series of pores situated on elevations along the lateral and ventral fields and connected with glandular cells in the longitudinal chords. Lordello also mentions a nematode found in the tail region. The nematode is 752 μ long and 21 μ wide.

-Phytopathology.
MINTON, N. A. & CAIRNS, E. J., 1957.—“Suitability of soybeans var. Ogden and twelve other plants as hosts of the spiral nematode.” 47 (5), 313.

den
Soya bean var. *Ogden* grown in the green-house and inoculated with 500 *Helicotylenchus nannus* grew significantly less roots than control plants. Seed yields were not significantly different. Nematode populations increased about tenfold. *H. nannus* multiplied on cotton, Ladino clover, oats, grain, sorghum and on the grasses, Dallis, Bermuda, nut, Johnson, fescue, Sweet Sudan and orchard. Visible root damage occurred only on the soya beans.
J.B.G.

—PENDER, M. T., 1957. “Soybean cyst nematode.” [Abstract.] Proceedings. Association of Southern Agricultural Workers, 54th Annual Convention (1957), p. 142.
Pender reports on the occurrence in the U.S.A. of *Heterodera glycines* on soya beans, which is confined to 1,680 acres in North Carolina. Quarantine measures are in force to prevent further spread of the nematode. Control is mainly by growing non-host crops in infested soil.
D. J. Hooper

-Plant Disease Reporter.

ROSS, J. P. & BRIM, C. A., 1957.—“Resistance of soybeans to the soybean cyst nematode as determined by a double-row method.” 41 (11), 923-924.

In the spring of 1957, 2,800 selections and varieties of soya bean (*Glycine max*) were tested for resistance to the soya bean cyst nematode, *Heterodera glycines*. Seeds of test plants were sown in rows 5 ft. long, and a known susceptible variety was sown as a control in two rows each 6 in. from the test plant row. Resistance was assessed by counting white cysts on the roots of test and control plants. After the first test, eight varieties were selected for rechecking; two of these proved to be non-resistant.
J.J.H.

-Phytopathology.

SHANDS, Jr., W. A. & CRITTENDEN, H. W., 1957.—“The influence of nitrogen and potassium on the relationship of *Meloidogyne incognita acrita* and soybeans.” 47 (7), 454.

Tests on the soya bean varieties Anderson, Wabash and Adams, respectively resistant, moderately susceptible and susceptible to *Meloidogyne incognita acrita*, showed that with the addition of nitrogen and potassium there was a general increase in the penetration of this eelworm larva into the Anderson variety (although galls were not present) and in the amount of gall formation on the Wabash and Adams varieties. The addition of legume bacteria increased penetration of the Anderson variety and the amount of galls on the Adams variety.
R.T.L.

SPEARS, J. F., BALCOMBE, S. C. & HEMERICK, G., 1957.—“Detection of *Heterodera glycines* in North Carolina.” 47 (1), 33.

During 1956 more than 100,000 acres of soya beans in eastern North Carolina were inspected for symptoms of *Heterodera glycines* infection. Five infested properties were discovered extending the limits of the area of infestation three miles east, three miles west and seven miles north. Symptoms of attack were visible on snap bean and soya bean foliage six weeks after planting where the pre-planting cyst count had been between five and 200 per lb. of soil, and 12 weeks after planting where the count had been one cyst per lb. Where the count was one cyst per 10 lb. soil per acre no symptoms were observed.
S.W.

—TAYLOR, A. L., 1957.—“A review of the literature pertaining to the soybean cyst nematode.” Washington, D.C.: U.S. Department of Agriculture, Agricultural Research Service, 7 pp.

This review gives details of the history of the soya bean cyst nematode *Heterodera glycines*. The distribution of the eelworm, its life-history, host plants (good and bad) and general biology are mentioned, and control measures involving crop rotation or chemical treatment are discussed.
J.J.H.

-Phytopathology

CRITTENDEN, H. W., 1958.—“Histology and cytology of susceptible and resistant soybeans infected with *Meloidogyne incognita acrita*.” 48 (8), 461.

In a comparison of three resistant with five susceptible soya bean varieties inoculated with *Meloidogyne incognita* var. *acrita*, Crittenden found that, as compared with susceptible varieties, the resistant varieties had fewer giant cells with less dense cytoplasm and fewer enlarged nuclei, a smaller giant cell area, which did not spread into the pericycle, and the nematode head was not surrounded by giant cells.
M.T.F.

—Phytopathology.

ENDO, B. Y. & SASSER, J. N., 1958.—“Soil fumigation experiments for the control of the soybean cyst nematode, *Heterodera glycines*.” 48 (10), 571-574.

Endo & Sasser successfully reduced the numbers of *Heterodera glycines* cysts in the soil and the numbers of females on the roots of soya beans, whilst increasing nodulation, growth and yield. The following replicated pre-plant treatments were used: D-D at 40 and 60 U.S. gal. per acre, Telone at 40 U.S. gal. per acre, Nemagon at 5 U.S. gal. per acre and methyl bromide gas at 1 and 2 lb. per 100 sq. ft. The improved plant growth following treatment also permitted the increase in the numbers of nematodes surviving fumigation. Methyl bromide at 3 lb. per 100 sq. ft. proved phytotoxic and Dowfume W-85 was ineffective in reducing infestation. Rotation combined with fumigation is suggested as the best control measure available. J.B.P.

—Plant Disease Reporter.

EPPS, J. M., 1958.—“Viability of air-dried *Heterodera glycines* cysts.” 42 (5), 594-595.

No viable larvae of the soya bean cyst nematode were found in cysts stored for one month or longer with soya bean seed in bags. Cysts stored with soya bean seed in large clay saucers contained live larvae after one month's storage, but no live larvae were found here after two months. J.J.H.

FERRIS, V. R. & BERNARD, R. L., 1958.—“Plant parasitic nematodes associated with soybeans in Illinois.” 42 (6), 798-801.

Ferris & Bernard describe their sampling methods and list the genera found in soya bean fields from various locations, together with previous cropping. The genera found to be widely distributed include *Pratylenchus*, *Paratylenchus*, *Helicotylenchus* and *Tylenchorhynchus*. Comparisons among fields under rotation indicated that the higher counts of *Pratylenchus* and *Helicotylenchus* in the soil were often associated with maize, whereas the higher counts of *Paratylenchus* were associated with soya bean culture. A.M.S.

—ISIKAWA, M. & MIYAHARA, T., 1958. [Kariwano Experimental Farm, Tōhoku National Agricultural Experiment Station, Akita-ken, Japan.] [Reaction of soya bean varieties to the soya bean nematode (*Heterodera glycines*).] *Japanese Journal of Breeding*, 8 (2), 111-118. [In Japanese: English summary p. 118.]

Among 64 soya bean varieties which were tested in 1956 and 49 varieties in 1957, the authors found that the following eight varieties were highly resistant to the soya bean cyst nematode, *Heterodera glycines*: Nangun-takedate, Tanryoku (2), Meguro, Geden-shirazu No. 1, Takedate No. 1, Iwate-yagi No. 1, Iwate No. 2. and Daiichi-hienuki. All of these are late-ripening varieties in Tōhoku district (the north-eastern district of Honshū). The authors also studied the correlation between the susceptibility of soya bean varieties to this nematode and the growth of the plants. M. Ichinohe

—LANIER, T. J., 1958. “The establishment of the Soybean Cyst Nematode Identification Laboratory at Memphis, Tennessee.” [Abstract.] *Proceedings. Association of Southern Agricultural Workers*, 55th Annual Convention (1958), p. 116.

Soya bean cyst nematode (*Heterodera glycines*) was found in New Hanover County, North Carolina in 1954. In 1956 it was found in a soya bean-producing area along the Mississippi River. An intensive survey of the nematode's distribution was undertaken and a Soya Bean Nematode Identification Laboratory was set up in Memphis, Tennessee. This paper gives a summary of the techniques used in the laboratory. J. J. Hesling

—LORDELLO, L. G. E., ZAMITH, A. P. L. & ARRUDA, H. V. DE, 1958. [Escola Superior de Agricultura “Luiz de Queiroz”, Universidade de São Paulo, Piracicaba, Brazil.] “Nematódeos que prejudicam as culturas de soja e do algodoeiro no Estado de S. Paulo e sua interferência nos planos de rotação.” *Revista de Agricultura*. São Paulo, 33 (3), 161-166. [English summary pp. 164-165.]

Poorly growing cotton plants had their roots severely attacked by *Pratylenchus steineri*; soya beans were also damaged by this celworm and by root-knot nematodes. It is concluded that the rotation “soya bean-cotton” is inconvenient because the *Pratylenchus* population will increase on the soya beans and have severe effects on the following cotton crop. J. J. Hesling

CRITTENDEN, H. W., 1959.—"Pathogen-suscept relationship of *Meloidogyne incognita* *acrita* and *Glycine max*." 19 (9), 2219.

Crittenden examined the roots of susceptible and resistant varieties of *Glycine max* after inoculating them with *Meloidogyne incognita* var. *acrita* larvae. Healthy plants were also examined. No cytological or histological differences were observed between the roots of uninfected healthy susceptible and resistant varieties of soya beans. These differences were evident in the case of infected plants. The giant cells occupied much smaller spaces in the roots of resistant varieties and the nematode's head was at the side of these cells. In the susceptible varieties the head was surrounded by the giant cells, which had dense cytoplasm and irregularly thickened walls. The areas of larval invasion of the susceptible plants showed an increased number and size of pericycle cells, whereas this phenomenon was, if at all, manifested to a much lesser degree in the resistant varieties. In susceptible soya bean plants there was also a reduction in the number of tertiary roots as a result of infection of the primary and secondary ones. Soya beans were most susceptible to *M. incognita* var. *acrita* infection at sowing time, but they remained so to some degree for nine weeks after sowing. N I

—CRITTENDEN, H. W., 1959. "Production of lateral roots in soybean varieties resistant and susceptible to *Meloidogyne incognita acrita*." [Abstract of paper presented at the 16th Annual Meeting of the Potomac Division, American Phytopathological Society, Beltsville, Md, U.S.A., February 26-27, 1959.] *Phytopathology*, 49 (8), 523.

Two resistant and two susceptible varieties of soya bean were grown for periods of 8, 16 and 32 days in uninfested soil and in soil infested with *Meloidogyne incognita* var. *acrita*. Invasion by the eelworm in secondary roots of the two susceptible varieties caused a significant decrease in the number of tertiary roots produced compared with uninfested plants. There was no difference in the number of tertiary roots in infected and uninfested resistant plants. Inhibition of tertiary root formation is positively correlated with enlargement of the pericyclic region in areas of invaded secondary roots in susceptible varieties. Size of gall caused by *M. incognita* var. *acrita* and the number of lateral roots produced in soya bean varieties are affected by potassium. A. M. Shepherd

-Phytopathology.

DRÖPKIN, V. H., 1959.—"Varietal response of soybeans to *Meloidogyne*—a bioassay system for separating races of root-knot nematodes." 49 (1), 18-23.

Dropkin investigated host-parasite relationships in nine inbred lines of *Zea mays*, ten lines of *Avena* sp. and 19 varieties of *Glycine max* inoculated with four or five of the following root-knot nematodes—*Meloidogyne arenaria*, *M. arenaria* subsp. *thamesi*, *M. incognita*, *M. incognita* var. *acrita* and *M. hapla*. The degree of galling, egg mass production, histology of the galls and nematode sex ratios were compared. The various lines of *Zea* behaved differently both within the lines to the different nematode species and between the lines to each separate species. In oats the galls were small and hard to estimate. Soya beans were most suitable for bioassay and the varieties differed both in degree of galling and in egg mass production when exposed to any one species of nematode. The effects of the different nematode species on a single variety of soya bean were also varied. Egg mass production and number of males were independent of gall size. Sex ratios varied with different combinations of host and parasite. There was a correlation between giant cell structure and egg mass production. Two populations of *M. incognita* var. *acrita* could be distinguished by their different behaviour on soya beans. M.T.F.

—ICHINOHE, M., 1959. [National Institute of Agricultural Sciences, Tokyo, Japan.] "Studies on the soybean cyst nematode *Heterodera glycines* and its injury to soybean plants in Japan." *Plant Disease Reporter*, Supplement 260, pp. 239-248.

This is a comprehensive account of the soya bean cyst nematode which includes an historical review and details of the distribution of the eelworm in Asia. The eelworm morphology is described and host plants are listed. Damage to the plant, the nature of varietal resistance and control measures are discussed. J. J. Hesling

-Phytopathology (cont.)

ROSS, J. P., 1959.—"Influence of resistance to *Heterodera glycines* on soybean yield and nematode populations." 49 (5), 319.

The soya bean cyst nematode, *Heterodera glycines* will not reproduce on the roots of the soya bean variety "Peking". "Peking", and a susceptible variety of soya bean, were planted in untreated soil and in soil treated with Nemagon broadcast at a rate of 3 gallons per acre; in this way the influence of the resistance of "Peking" on yield and nematode population could be determined. The respective yields of susceptible and resistant plants in untreated plots was 37% and 60% of the yields of soya beans grown in treated plots. Root nodules were abundant on "Peking" one month after planting in untreated soil, while the susceptible soya bean had few nodules. There was a correlation between the nematode population density and soya bean yield in the susceptible line; after maturity the average population in untreated plots was three larvae per pint of soil for "Peking" and 320 larvae per pint for the susceptible soya bean. J.J.H.

—ROSS, J. P., 1959. "Interaction of *Meloidogyne incognita incognita* and *Heterodera glycines* on soybeans." [Abstract of paper presented at the 51st Annual Meeting of the American Phytopathological Society, University Park, Pa., August 31 to September 2, 1959.] *Phytopathology*, 49 (9), 549.

Ross studied the interaction of *Meloidogyne incognita incognita* and *Heterodera glycines* in methyl bromide sterilized soil in microplots; the soil was artificially infested. The *Meloidogyne* population was suppressed in the last two-thirds of the growing season in the presence of *H. glycines*. Soya bean cyst nematode disease was intensified by the presence of the root-knot nematode. Results were assayed by counts of *Heterodera* and *Meloidogyne* larvae in soil, and by yields of soya bean per plant.

J. J. Hesling

—ROSS, J. P., 1959. [North Carolina Agricultural Experiment Station, Raleigh, North Carolina, U.S.A.] "Nitrogen fertilization on the response of soybeans infected with *Heterodera glycines*." *Plant Disease Reporter*, 43 (12), 1284-1286.

Nitrogen applied as nitrate of ammonia at 20, 120 and 210 lb. per acre to soya beans on *Heterodera glycines* infested land increased both the soya bean yield and the final nematode populations.

J. J. Hesling

—SCHILKE, P. J. & CRITTENDEN, H. W., 1959. "Host-parasite relationships of soybean and a root-knot nematode *Meloidogyne hapla*." [Abstract of paper presented at the 16th Annual Meeting of the Potomac Division, American Phytopathological Society, Beltsville, Md, U.S.A., February 26-27, 1959.] *Phytopathology*, 49 (8), 525.

In three varieties of soya bean (Laredo, Anderson and Adams) exposed to the root-knot nematode *Meloidogyne hapla* for periods of from seven to 56 days, there were differences in the rate of gall formation and egg-mass development and also in the numbers of larvae invading the roots. Adams appears to be the most efficient host from all these aspects. Growth of the apical meristem often ceased in invaded roots and numerous lateral roots arose from the region of the galls. No differences were observed between giant cells in each of the varieties.

A. M. Shepherd

—TAYLOR, D. P. & WYLLIE, T. D., 1959. "Interrelationship of root knot nematodes and *Rhizoctonia solani* on soybean emergence." [Abstract of paper presented at the 51st Annual Meeting of the American Phytopathological Society, University Park, Pa., August 31 to September 2, 1959.] *Phytopathology*, 49 (9), 552.

In a green-house experiment, *Meloidogyne javanica* and *M. hapla* in combination with *Rhizoctonia solani* had a severe effect on the emergence of soya beans. Emergence, expressed as a percentage of the control, was as follows: *M. javanica* alone, 98%; *M. hapla* alone, 83%; *R. solani* alone, 50%; *M. javanica* plus *R. solani*, 17%; *M. hapla* plus *R. solani*, 2%.

A. M. Shepherd

2187—CALDWELL, B. E., BRIM, C. A., & ROSS, J. P., 1960. "Inheritance of resistance of soybeans to the cyst nematode, *Heterodera glycines*." *Agronomy Journal*, 52 (11), 635-636. Resistance of soya beans to *Heterodera glycines* is due to 3 independently inherited recessive genes.

H.R.W.

—DROPKIN, V. H. & NELSON, P. E., 1960. [Crops Research Division, ARS, USDA, Beltsville, Maryland, U.S.A.] "The histopathology of root-knot nematode infections in soybeans." *Phytopathology*, 50 (6), 442-447.

By means of serial sections of soya bean (*Glycine max*) roots Dropkin & Nelson studied the histological reactions of 19 varieties to invasion and development of the root-knot nematodes *Meloidogyne incognita* and *M. incognita* var. *acrita*. In susceptible varieties there was no obvious damage to the cortex but from the third day after invasion there was intense cell multiplication around the larval head. A few cells in contact with the head enlarged greatly and coalesced with adjacent cells. In the giant cells thus produced mitoses ceased after the first few days but nuclei were added from the coalescing cells. Four types of giant cells are described but nematodes develop vigorously in only one type, that in which the large multinucleate cells have dense, evenly granular cytoplasm and greatly thickened walls. The nuclei may be large with large nucleoli or smaller and clustered in groups towards the centre of the cell. Unsatisfactory development of nematodes is associated with giant cells which are only slightly enlarged or have vacuolated cytoplasm, or cell walls only partly thickened. It is concluded that resistance of soya beans to root-knot nematodes is shown by cell reaction, but the size of the nematodes and egg masses could not be correlated with the size of the giant cells.

M. T. Franklin

—EPPS, J. M., 1960. "Evaluation of crops rotation and soil fumigation for controlling the soybean cyst nematode." [Abstract of paper presented at the 52nd Annual Meeting of the American Phytopathological Society, August 1960.] *Phytopathology*, 50 (9), 635.

—ROSS, J. P., 1960. "Soybean cyst nematode control by crop rotation." [Abstract of paper presented at the 52nd Annual Meeting of the American Phytopathological Society, August 1960.] *Phytopathology*, 50 (9), 652.

-ROSS, J. P., 1960. "The effect of soil temperatures on development of *Heterodera glycines* in soybeans." [Abstract of paper presented at the 52nd Annual Meeting of the American Phytopathological Society, August 1960.] *Phytopathology*, 50 (9), 652.

-SASSER, J. N. & UZZELL, Jr., G., 1960. [North Carolina Agricultural Experiment Station, Raleigh, North Carolina, U.S.A.] "Methyl bromide fumigation of *Heterodera glycines* in North Carolina." *Plant Disease Reporter*, 44 (9), 728-732.

Sasser & Uzzell describe attempts to eradicate soya bean cyst nematodes with methyl bromide in an experimental chamber and test. Heavily infested soil was used as test material. The initial dose appeared to be more important than length of exposure to the gas. At higher temperatures doses could be reduced for effective kill.

J. E. Peachey

-WYLLIE, T. D. & TAYLOR, D. P., 1960. [Department of Plant Pathology and Botany, University of Minnesota, St. Paul, Minnesota, U.S.A.] "*Phytophthora* root rot of soybeans as affected by soil temperature and *Meloidogyne hapla*." *Plant Disease Reporter*, 44 (7), 543-545.

In experiments at various temperatures, Wyllie & Taylor found that inoculation of Harosoy soya beans with both *Phytophthora sojae* and *Meloidogyne hapla* caused more severe symptoms than either pathogen alone. *P. sojae* alone had a more severe effect on plant growth than did *M. hapla* at the inoculation rates used. Damage by these organisms was most severe at soil temperatures above 20°C. and increased as temperature increased up to 30°C. to 35°C. For *M. hapla* alone, however, the optimum temperature was 25°C. to 30°C., this being the temperature at which most severe galling occurred.

A. M. Shepherd

-ANON., 1961. "Soybean cyst nematode. Progress in research and control." Washington, D.C.: U.S. Department of Agriculture, Agricultural Research Service, ARS 22-72, 20 pp.

-DROPKIN, V. H. & NELSON, P. E., 1961. "The pathogenicity of *Meloidogyne* spp. (root-knot nematodes), particularly on soybeans." In: "Recent advances in botany", (International Botanical Congress (9th), Montreal, 1959). Toronto: University of Toronto Press, Vol. I, pp. 410-414.

-FERRIS, V. R., 1961. "A new species of *Pratylenchus* (Nemata-Tylenchida) from roots of soybeans." *Proceedings of the Helminthological Society of Washington*, 28 (2), 109-111. Ferris describes and figures *Pratylenchus alleni* n.sp. from the roots of soya bean in Illinois. It is closest to *P. neglectus*, synonym *P. minyus*, but has a spermatheca and a shorter spear, and males are present. It differs from *P. coffeae* in its smaller fatter body, the shorter spear and round spermatheca.

J.B.G.

-FERRIS, V. R. & BERNARD, R. L., 1961. "Seasonal variations of nematode populations in soybean field soil." *Plant Disease Reporter*, 45 (10), 789-793. The fluctuations in the numbers of plant-parasitic nematodes in soil in soya bean fields were studied over a three-year period. *Pratylenchus*, mainly *P. hexincisus* and *P. scribneri*, reached a peak soil population early in the growing season after which the numbers declined. However, numbers were very high in soya bean roots in August, 3,000 *Pratylenchus* being recovered from 3 gm. of roots. Soil populations of *Helicotylenchus*, *Paratylenchus* and *Tylenchorhynchus* (*T. martini* or *T. acutus*) built up during the growing season reaching a peak towards the end of the period. Very dry periods caused drops in the soil populations of most nematodes. D.J.H.

-ICHINOHE, M., 1961. "Studies on the soybean cyst nematode, *Heterodera glycines*." Report of the Hokkaido National Agricultural Experiment Station, No. 56, 80 pp. [Japanese summary pp. 78-80.]

This is a comprehensive account of the morphology, bionomics and control of *Heterodera glycines* based on the author's studies during 1949-58 at Hokkaido. The main topics include: the morphology of various stages, systematics, nematode development on host and non-host plants, the possible number of generations per year in Hokkaido, development on a non-host plant grafted on to host-plant stock, the relationships between plant damage and eelworm population, populations in cropping host and non-host plants, populations in a plot cropped successively with soya beans, the resistance of soya bean varieties to the eelworm, control by cropping and the present situation and future prospects of chemical control in Japan.

-CRITTENDEN, H. W., 1962. "Effect of *Meloidogyne incognita acrita* in nodulating and non-nodulating strains of soybean." [Abstract of paper presented at the 1961 Meeting of the Potomac Division of the American Phytopathological Society.] *Phytopathology*, 52 (2), 163. In green-house tests, Crittenden found that *Meloidogyne incognita* var. *acrita* caused excessive root enlargement in a nodulating strain of soybean. In a non-nodulating strain with the same genotype as the first except for the single nodulating gene, root enlargement was slight. The histopathology of nodules in both strains was similar but female nematodes matured quicker in the non-nodulating strain. The term "lysigenoma", a morbid condition formed by the break-down of adjoining cells, is proposed for the nematode feeding area presently known as "giant cells". C.D.B.

-EPPE, J. M. & CHAMBERS, A. Y., 1962. "Effects of seed inoculation, soil fumigation, and cropping sequences on soybean nodulation in soybean-cyst-nematode-infested soil." *Plant Disease Reporter*, 46 (1), 48-51.

The addition of *Rhizobium japonicum* to soya bean seed failed to increase nodulation in soil heavily infested with *Heterodera glycines*. Soil fumigation increased nodulation in two of six experiments and in these there was a corresponding decrease in the number of white females of *H. glycines* on the soya bean roots. Studies of the effect on nodulation of introducing a non-host (cotton) into a soya bean cropping sequence gave conflicting results. Eppe & Chambers state that the cause of reduced nodulation in soil infested by *H. glycines* has not been established and they suggest that a complex of nematodes and root rot organisms may be responsible. H.R.W.

-EPPE, J. M. & CHAMBERS, A. Y., 1962. "Effects of seed inoculation, soil fumigation, and cropping sequences on nodulation of soybeans grown in soybean-cyst-nematode-infested soil." [Abstract of paper presented at the 53rd Annual Meeting of the American Phytopathological Society, 1961.] *Phytopathology*, 52 (1), 9. In soil heavily infested with *Heterodera glycines*, the addition of *Rhizobium japonicum* to Lee soya bean seed did not increase nodulation significantly. However, increases were highly significant when granular 1,2-dibromo-3-chloropropane was applied in rows at 1.0, 0.75 or 0.5 U.S. gal. per acre at sowing, followed 3 weeks later with 0.5 or 0.25 U.S. gal. per acre as a side-dressing. Broadcast applications of liquid 1,3-dichloropropene plus 1,2-dibromopropane at 40 U.S. gal. per acre and a mixture of 1,3-dichloropropene plus 1,2-dibromoethane at 12 U.S. gal. per acre gave highly significant increases, whereas 1,2-dibromoethane at 4.5 U.S. gal. per acre gave significant increases. The effect of some cropping sequences on nodulation of soya beans was also studied. C.D.B.

-FERRIS, V. R. & BERNARD, R. L., 1962. "Injury to soybeans caused by *Pratylenchus alleni*." *Plant Disease Reporter*, 46 (3), 181-184.

Green-house pot experiments with soya bean plants showed that the presence of *Pratylenchus alleni* reduced the root weight by 25% whilst top growth was unaffected. The reduction in root growth occurred at a level of infection comparable to that of field-grown plants. J.W.

-ENDO, B. Y., 1962. "Anatomical studies of soybean roots artificially inoculated with *Heterodera glycines*." [Abstract.] *Phytopathology*, 52 (8), 731.

In soya bean seedlings infested with *Heterodera glycines* necrosis and discoloration occurred in root cells near the head of the nematode. Giant cells usually occurred internally to the endodermis although the cytoplasm of adjacent cortical cells often became granular. A.M.S.

-ROSS, J. P., 1962. "Crop rotation effects on the soybean cyst nematode population and soybean yields." *Phytopathology*, 52 (8), 815-818.

Crop rotation plots containing *Heterodera glycines* were studied from 1957 to 1960. A 4-year rotation with a non-susceptible crop prevented a subsequent development of large populations of *Heterodera glycines* on soya bean. Although nematode populations rose to a high level on soya beans following 2 years of cowpeas, soya bean yields were no lower than those following 3 years of cowpeas. There were no differences in soya bean yields or in post-season nematode populations among 2-year rotations involving cowpeas, corn or cotton as non-host crops. H.R.W.

-ROSS, J. P., 1962. "Physiological strains of *Heterodera glycines*." *Plant Disease Reporter*, 46 (11), 766-769.

Populations of *Heterodera glycines* from North Carolina and Tennessee were compared for ability to develop on a soya bean line rated resistant in Tennessee and susceptible in North Carolina and on a variety rated susceptible in both States. In 2 experiments, females of the Tennessee population rarely developed on the resistant soya bean line while development of the North Carolina population was not inhibited. Development of both populations was equal on the susceptible variety. Ross concludes that these data demonstrate the existence of physiological specialization of *H. glycines*. H.R.W.

RYDER, H. W. & CRITTENDEN, H. W., 1962. "Interrelationship of tobacco ringspot virus and *Meloidogyne incognita acrita* in roots of soybean." [Abstract of paper presented at the 1961 Meeting of the Potomac Division of the American Phytopathological Society.] *Phytopathology*, 52 (2), 165-166.

Soya beans infested with tobacco ringspot virus grown for 42 days from seed in soil infested with *Meloidogyne incognita* var. *acrita* had much reduced root systems which were heavily galled. Roots with the nematodes alone were not reduced significantly in length although there was extensive galling. Roots of virus-infected but nematode-free plants were as long as roots of virus-free plants grown in sterilized soil. Microscopical examinations of nematode-infested roots showed that when the virus was present the lysigenomata had more bumping of the nuclei, more nuclei in the vicinity of a nematode head and more protoplasm. D.J.H.

RYDER, H. W. & CRITTENDEN, H. W., 1962. "Interrelationship of tobacco ringspot virus and *Meloidogyne incognita acrita* in nematode resistant and susceptible soybeans." [Abstract.] *Phytopathology*, 52 (11), 1220.

The influence of tobacco ringspot virus (TRSV) on the reactions of susceptible and resistant soya bean varieties to *Meloidogyne incognita* var. *acrita* was studied in green-house and field tests. Plants were inoculated with the virus at 2, 4 and 6 weeks after planting, and with the nematode at the time of planting and then at 2, 4 and 6 weeks. 12 combinations of both pathogens were used as treatments for each variety. Nematode penetration and maturation were recorded and studies made of the histopathology and cytopathology of invaded roots. The presence of TRSV in any soya bean variety did not appear to influence its reaction, in any of the characteristics studied, to *M. incognita* var. *acrita*. T.D.W.

BERGESON, G. B. & ATHOW, K. L., 1963. "Vector relationship of tobacco ringspot virus (TRSV) and *Xiphinema americanum* and the importance of this vector in TRSV infection of soybean." [Abstract.] *Phytopathology*, 53 (8), 871.

Xiphinema americanum became virus-carrying 8 to 24 hours after having access to a plant infected with TRSV. *X. americanum* stored in soil at 10°C. for 19 weeks was still able to transmit TRSV to 60% of indicator plants. It also transmitted TRSV to soya bean roots but the virus rarely became systemic from root infection. Control of *X. americanum* in field trials reduced the number of soya bean root infections but had no effect on the amount of foliar infection. Experiments indicate that an aerial insect is mainly responsible for TRSV dissemination in soya beans. D.J.H.

ENDO, B. Y., 1963. "Penetration, infection, and development of *Heterodera glycines* in soybean roots and related anatomical changes." [Abstract.] *Phytopathology*, 53 (6), 622-623. Second-stage larvae of *Heterodera glycines* penetrated the roots of soya bean variety Lee and had inserted their stylets into cortical, endodermal or pericycle cells within 24 hours. In 2 to 6 days enlarged multinucleate syncytia had developed in contact with the nematodes, especially where they were near the protoxylem poles. Opposite the protophloem the development of syncytia was limited. Near developing males the syncytia began to degenerate in 9 days, but they remained healthy where females developed. If syncytia were in the region of secondary cambium the development of secondary tissues was hindered. The syncytia degenerated, probably when nematode feeding ceased, and parenchyma cells developed into the regions occupied by degenerate shrunken syncytia. M.T.F.

EPPS, J. M. & CHAMBERS, A. Y., 1963. "Influence of planting date on yield of soybeans in fumigated and untreated soil infested with *Heterodera glycines*." *Plant Disease Reporter*, 47 (7), 589-593.

Yields of soya beans were not substantially increased by altering the date of planting in fields infested with *Heterodera glycines*; late plantings were better on fumigated land. J.E.P.

SASSER, J. N. & UZZELL, Jr., G., 1963. "Control of the soybean cyst nematode by crop rotation." [Abstract.] *Phytopathology*, 53 (6), 625

An experiment in which one and 2-year rotations of soya bean corn are combined with spring D-D applications is reported. The yield of soya beans is doubled by a one-year and trebled by a 2-year rotation. Fumigation before planting soya bean in a one-year rotation trebled the yield but was not effective for the following soya bean crop. Fumigation before planting corn in a one-year rotation increased the yield 5 times. C.D.G.

SASSER, J. N. & UZZELL, Jr., G., 1963. "Influence of nonhost crops alone or in combination with a nematocide on the longevity of the soybean cyst nematode in soil." [Abstract.] *Phytopathology*, 53 (6), 625.

Maize was grown on infested soil in microplots and various D-D treatments were applied. As long as soya beans were not planted, the infestation level of *Heterodera glycines* was reduced and remained low. In 4 years eradication only occurred when a preplant treatment of 40 gal. per acre of D-D was applied. C.D.G.

ENDO, B. Y., 1964. "Penetration and development of *Heterodera glycines* in soybean roots and related anatomical changes." *Phytopathology*, 54 (1), 79-88.

Whole mounts and sections of soya bean roots inoculated with *Heterodera glycines* showed that second-stage larvae penetrated as far as the pericycle within one day. Passage through the cortex was mainly intracellular and cells on which nematodes had fed quickly hypertrophied, their walls broke down and they formed syncytia within 2 to 6 days. Syncytial development was more pronounced when nematodes settled to feed near protoxylem poles than near protophloem. Syncytia associated with males began to degenerate after 9 days, but those on which females fed remained healthy for at least 3 weeks. When feeding by mature females declined, degenerating syncytia associated with them became invaded by parenchyma. C.C.D.

EPPS, J. M. & CHAMBERS, A. Y., 1964. "Nematocidal seed treatment for control of *Heterodera glycines* in soybeans." [Abstract.] *Phytopathology*, 54 (6), 622.

DBCP was coated on to soya bean seed to the equivalent of 0.125, 0.25, 0.33 and 0.5 gal. per acre at a seeding rate of 45 lb. per acre. The nematicide reduced stands of plants in most experiments between 1961 and 1963. White females of *Heterodera glycines* were reduced with all rates of DBCP, but yields of soya bean were not increased and were significantly decreased by the 0.5 gal. per acre rate in 2 experiments. J.B.G.

—EPPS, J. M. & CHAMBERS, A. Y., 1964. "Behaviour of populations of *Heterodera glycines* under various cropping sequences in field bins." [Abstract.] *Phytopathology*, 54 (6), 622.

Population changes of *Heterodera glycines* were studied under 7 different 5-year cropping sequences in naturally infested, wood-framed field bins. Populations remained at uniformly high levels with a continuous sequence of susceptible soya beans (var. Hill). When sequences of continuous cotton or resistant soya bean (var. Peking) were grown, no nematodes were found in samples after the 2nd crop year, but at the end of 4 years enough were present to attack Hill soya beans in greenhouse tests. Where susceptible and resistant crops were alternated, *H. glycines* populations fluctuated from moderately high to very low levels. The first susceptible soya bean crop grown after 2 years of cotton gave extremely high population levels; the population levels fell after the 2nd susceptible crop and became comparable with those following continuous Hill soya beans, and levelled off in the next soya bean crop. When 2 crops of Hill

—EPPS, J. M., SASSER, J. N. & UZZELL, Jr., G., 1964. "Lethal dosage concentrations of nematocides for the soybean cyst nematode and the effect of a nonhost crop in reducing the population." *Phytopathology*, 54 (10), 1265-1268.

In microplot tests, populations of *Heterodera glycines* were greatly reduced by fumigation at low concentrations with methyl bromide or D-D. Planting a non-host crop after treatment tended further to reduce residual populations, but nematodes were recovered from plots after non-host crops had been grown for 3 years following fumigation. When soya beans were planted after fumigation there was a rapid increase in nematode populations, often to higher numbers than in untreated plots. C.E.T.

—PETERSON, E. A. & KATZNELSON, H., 1964. "Occurrence of nematode-trapping fungi in the rhizosphere." [Correspondence.] *Nature*, London, 204 (4963), 1111.

Root-free soil, rhizosphere soil from around the roots of soya bean and wheat plants and washed root segments were examined for predacious fungi; only *Arthrobotrys oligospora* was consistently found. Predacious fungi were absent from root segments, but *A. oligospora* was recorded from 86% of soya bean rhizosphere samples, 32% of wheat, and 62% of root-free soil samples, suggesting that this species is a soil-inhabiting organism. The more frequent occurrence of *A. oligospora* in the soya bean rhizosphere may be accounted for by the greater abundance of nematodes found associated with the soya bean than with the wheat rhizosphere. A.M.S.

—ROSS, J. P., 1964. "Interaction of *Heterodera glycines* and *Meloidogyne incognita* on soybeans." *Phytopathology*, 54 (3), 304-307. For 3 seasons, soya beans var. Lee were grown in clean soil or in soil inoculated with either *Heterodera glycines*, *Meloidogyne incognita* or a combination of the 2. Samples of soil from the plots were assessed 4 times in each season for population levels of the 2 nematodes. It was found that population levels of root-knot nematodes were lower in the presence of *H. glycines* than when alone and the

degree of inhibition of root-knot nematodes varied indirectly with the initial level of the population. Cyst nematode populations were unaffected by low levels of root-knot nematode populations but when initial population levels of root-knot nematodes were high, the cyst nematodes failed to increase to as high a level later in the season as they did in presence of smaller populations of root-knot nematodes. When the root-knot population started at a moderate level the cyst population level was kept low initially but later in the season rose higher than in the absence of root-knot. *H. glycines* alone caused symptoms of disease in the foliage of soya beans and such symptoms were intensified in the presence of moderate to high infestations of *M. incognita*. Yield reduction caused by both nematodes combined was approximately additive, while protein in soya bean seed was increased in plants infested with root-knot nematodes but reduced in plants infested with *H. glycines*. M.T.F.

—ROSS, J. P., 1964. "Effect of soil temperature on development of *Heterodera glycines* in soybean roots." *Phytopathology*, 54 (10), 1228-1231.

Exposure of soya bean roots to temperatures above 32°C. immediately after infestation with *Heterodera glycines* slowed nematode development, increased the percentage of larval degeneration and increased the adult male: female ratio, compared with populations maintained at 24°C. When temperatures fluctuated, the longer the high-temperature exposure or the higher the temperature, the more dominant were males. C.E.T.

—SMART, Jr., G. C., 1964. "Physiological strains and one additional host of the soybean cyst nematode, *Heterodera glycines*." *Plant Disease Reporter*, 48 (7), 542-543.

Evidence is given of physiological strains in *Heterodera glycines*. The development of 2 isolates of the nematode on *Penstemon digitalis*, *P. unilateralis* and *Glycine max* are compared. One isolate from North Carolina failed to develop on the 2 species of *Penstemon* but developed successfully on soya bean. The second isolate from Arkansas developed successfully on all the plant species mentioned. *P. digitalis* is reported for the first time as a host of *H. glycines*. K.F.B.

—ENDO, B. Y., 1965. "Entry and development of *Heterodera glycines* Ichinohe in susceptible and resistant soybeans." [Abstract.] *Nematologica*, 11 (1), 36.

—ENDO, B. Y., 1965. "Histological responses of resistant and susceptible soybean varieties, and backcross progeny to entry and development of *Heterodera glycines*." *Phytopathology*, 55 (4), 375-381.

Changes in the root and the extent of development of *Heterodera glycines* were studied in the susceptible soya bean variety Lee, the resistant variety Peking and in progeny from a Lee × Peking cross. In the susceptible variety (Lee) development of male and female nematodes was associated with syncytial development and other root tissue changes. When nematode feeding ceased and syncytia had collapsed, rejuvenated parenchymatous cells invaded the regions around the syncytia. In the resistant variety (Peking), syncytia developed 2-3 days after inoculation but many had degenerated within 5 days of inoculation. Within 8-10 days of inoculation rejuvenated parenchyma cells had occupied the sites of the degenerate syncytia. The Lee × Peking BC₂F₄ roots were slightly less resistant than the resistant parent. T.D.W.

—EPPS, J. M. & CHAMBERS, A. Y., 1964. "Behaviour of populations of *Heterodera glycines* under various cropping sequences in field bins." [Abstract.] *Phytopathology*, 54 (6), 622.

Population changes of *Heterodera glycines* were studied under 7 different 5-year cropping sequences in naturally infested, wood-framed field bins. Populations remained at uniformly high levels with a continuous sequence of susceptible soya beans (var. Hill). When sequences of continuous cotton or resistant soya bean (var. Peking) were grown, no nematodes were found in samples after the 2nd crop year, but at the end of 4 years enough were present to attack Hill soya beans in greenhouse tests. Where susceptible and resistant crops were alternated, *H. glycines* populations fluctuated from moderately high to very low levels. The first susceptible soya bean crop grown after 2 years of cotton gave extremely high population levels; the population levels fell after the 2nd susceptible crop and became comparable with those following continuous Hill soya beans, and levelled off in the next soya bean crop. When 2 crops of Hill

—EPPS, J. M., SASSER, J. N. & UZZELL, Jr., G., 1964. "Lethal dosage concentrations of nematocides for the soybean cyst nematode and the effect of a nonhost crop in reducing the population." *Phytopathology*, 54 (10), 1265-1268.

In microplot tests, populations of *Heterodera glycines* were greatly reduced by fumigation at low concentrations with methyl bromide or D-D. Planting a non-host crop after treatment tended further to reduce residual populations, but nematodes were recovered from plots after non-host crops had been grown for 3 years following fumigation. When soya beans were planted after fumigation there was a rapid increase in nematode populations, often to higher numbers than in untreated plots. C.E.T.

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—SMART, Jr., G. C., 1964. "Physiological strains and one additional host of the soybean cyst nematode, *Heterodera glycines*." *Plant Disease Reporter*, 48 (7), 542-543.

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P. digitalis is reported for the first time as a host of *H. glycines*. K.F.B.

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—ENDO, B. Y., 1965. "Histological responses of resistant and susceptible soybean varieties, and backcross progeny to entry and development of *Heterodera glycines*." *Phytopathology*, 55 (4), 375-381.

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—EPPS, J. M. & CHAMBERS, A. Y., 1965. "Nature of resistance in soybean varieties resistant to *Heterodera glycines*." [Abstract.] *Phytopathology*, 55 (5), 498.

—EPPS, J. M., SASSER, J. N. & UZZELL, Jr., G., 1965. "Relative effectiveness of various nematocides in controlling the soybean cyst nematode and the added effect of a nonhost crop in reducing the population." [Abstract.] *Nematologica*, 11 (1), 36-37.

—OKADA, T., 1965. [Studies on the distribution of nematodes. I. Population density of soybean cyst nematode in soil and its influence on the distribution of the parasites and root development of soya beans.] *Res. Bull. Hokkaido natn. agric. Exp. Stn*, No. 87, pp. 74-86. [In Japanese: English summary pp. 85-86.]

The development of soy-bean roots was observed when they were allowed to grow through horizontal layers of test soil, each having a different density of *Heterodera glycines*. In the heavily infested layers, roots developed poorly. [From English summary.] J.E.P.

—ROSS, J. P., 1965. "Predisposition of soybeans to *Fusarium* wilt by *Heterodera glycines* and *Meloidogyne incognita*." *Phytopathology*, 55 (3), 361-364.

Experiments were carried out in the green-house and in microplots to test the effects of infestation with *Heterodera glycines* or *Meloidogyne incognita* on *Fusarium* wilt disease in varieties of soya bean having differing susceptibilities to these pathogens. In the green-house, wilt disease in the variety Jackson occurred in the presence of *H. glycines* and *F. oxysporum* but not with *F. oxysporum* alone. In microplots, no wilt was observed on this variety either with *Fusarium* alone or combined with *M. incognita*. The variety Lee, highly susceptible to both *H. glycines* and *M. incognita*, when grown in plots infested with the nematodes either separately or together with *Fusarium*, showed wilt symptoms only in the presence of nematodes. Vascular discoloration of the stem was 3 times higher in plants infested with *H. glycines* than with *M. incognita*. Cyst populations at the end of the growing season were significantly greater in plots with *Fusarium* than without, but no significant differences were found in *Meloidogyne* populations. The variety Yelredo, highly susceptible to wilt disease and *H. glycines*, died out after 16 weeks in plots with both pathogens, but in the absence of the nematode the plants were alive although wilted. In plots inoculated with *H. glycines* alone, the nematode multiplied to a greater extent than when wilt fungus was also present, probably because the plants died sooner when infested with both pathogens. M.T.F.

—BRIM, C. A. & ROSS, J. P., 1966. "Relative resistance of Pickett soybeans to various strains of *Heterodera glycines*." *Phytopathology*, 56 (4), 451-454.

The new soya bean variety Pickett was resistant to strains of *Heterodera glycines* in Missouri, North Carolina and Tennessee, but not in Virginia. D.W.L.

—CHAMBERS, A. Y. & EPPS, J. M., 1966. "Nature of resistance in soybean varieties and breeding lines resistant to *Heterodera glycines*." [Abstract.] *Phytopathology*, 56 (8), 873.

—HARLAN, D. P. & JENKINS, L., 1966. "Elimination of soybean cyst nematodes from the roots of plants by chemical dips." *Pl. Dis. Reprtr*, 50 (8), 548-549.

Heterodera glycines, either extracted from soil and mixed with sterile sand or attached to roots of soya bean were dipped for 30 min. in nematocides of several concentrations. Cynem [thionazin], Bayer 25141, Penphene and Niagara 9227 were tested but only Cynem at 2530 p.p.m. was entirely successful in eliminating the nematodes. D.W.L.

—MILLER, L. I., 1966. "Maturation of females of *Heterodera glycines* as influenced by inoculum level." [Abstract.] *Phytopathology*, 56 (6), 585.

—SASSER, J. N., NELSON, L. A. & GARRISS, H. R., 1966. "Quantitative effects of five nematode genera on growth and yield of peanuts, cotton and soybeans following granular nematocide treatments." [Abstract.] *Nematologica*, 12 (1), 98-99.

—SCHEETZ, R. W. & CRITTENDEN, H. W., 1966. "Histochemistry of soybean varieties resistant or susceptible to *Meloidogyne incognita acrita*." [Abstract.] *Phytopathology*, 56 (6), 586.

—SUGIYAMA, S. & HIROMA, K., 1966. "A resistant gene of soybeans to the soybean cyst nematode observed from the cross between Peking and Japanese varieties. (Preliminary report)." *Jap. J. Breed.*, 16 (2), 83-86. [Japanese summary p. 86.]

Peking, a soybean variety highly resistant to *Heterodera glycines*, was crossed reciprocally with the incompletely resistant variety Nemashirazu and the susceptible variety Shiromeyutaka. F_2 progenies of them were tested for resistance and relationships between resistance and some other characters. Frequencies of the resistant plants were $1/4$ for Peking $\times$ Nemashirazu, and near to $1/16$ for Peking $\times$ Shiromeyutaka, thus, indicating that one, for the former, or 2, for the latter, recessive genes are concerned with the resistance. In these crosses a coupling linkage between the resistance and i allele which determines the expression of seed coat colour to black or brown was found. This resistant recessive gene was determined as " r_{hg_1} ". J.B.

—BIRCHFIELD, W. & MOTSINGER, R., 1967. "Soybean cysts nematode found in Louisiana." *Pl. Dis. Reprtr*, 51 (10), 823.

Heterodera glycines is reported for the first time from Louisiana, U.S.A., from a soy-bean field in the north-east of the state. Severe chlorotic foliage and dwarfing of the plants occurred. Numerous lemon-shaped and lemon-coloured cysts were found which turned brown in transit to the laboratory. Abundant brown cysts were also recovered. S.W.A.

—CHAMBERS, A. Y. & EPPS, J. M., 1967. "Nature of soybean resistance to *Heterodera glycines*." *Pl. Dis. Repr.*, 51 (9), 771-774.

The authors rooted tops and stems of soy-bean plants of susceptible varieties Lee and Hill, resistant variety Peking, resistant strain NC 55 and resistant 63-7320 and D63-7327 and inoculated the roots with larvae of *Heterodera glycines*. The adventitious roots from tops and stems from all susceptible plants became heavily infected with white females; one was observed on adventitious roots of resistant plants. Scions of resistant Peking and NC 55 were grafted to susceptible Lee root-stocks, and Lee scions were grafted to Peking and NC 55 root-stocks. Roots of grafted plants with susceptible scions and resistant root-stocks were free of white females, while roots of grafted plants with resistance scions and susceptible root-stocks became heavily infected. The results suggest that the factor for resistance to susceptibility to *H. glycines* is not synthesized in one part of the soy-bean plant and translocated to other parts, but is probably genetically inherent in tops, stems and roots of resistant plants.
[A.S.] S.W.A.

—ENDO, B. Y., 1967. "Comparative reproduction of *Pratylenchus brachyurus* and *P. zaei* in corn and soybean varieties, 'Lee' and 'Peking'." [Abstract.] *Nematologica*, 13 (1), 140-141.

—ENDO, B. Y., 1967. "Comparative population increase of *Pratylenchus brachyurus* and *P. zaei* in corn and in soybean varieties Lee and Peking." *Phytopathology*, 57 (2), 118-120.

The soy-bean varieties, Peking (resistant to *Heterodera glycines*) and Lee (susceptible to *H. glycines*) were tested for resistance to *Pratylenchus brachyurus* and *P. zaei* to provide information for further breeding programmes. When Lee soy-beans were inoculated with 400 or 800 nematodes, the numbers of *P. zaei* present after 3 months varied with the inoculum but the numbers present after 7 months did not; the numbers of *P. brachyurus* present after 3 and 7 months was not affected by the numbers in the inoculum. Lee and Peking soy-beans seemed equally susceptible to both nematodes when the assay was based on the number of nematodes per g. of root but Lee seemed more susceptible than Peking to *P. zaei* when the assay was based on the number of nematodes in the entire root system and in the soil. *P. brachyurus* reproduced more rapidly in the soy-bean varieties and *P. zaei* reproduced more rapidly on Golden Bantam maize. The numbers of *P. brachyurus* increased more on Peking than on Lee soy-bean. The factors enabling Peking to resist *H. glycines* are not effective against root-lesion nematodes, and other sources must be sought for breeding resistance to these nematodes.

D.W.L.

—FERRIS, V. R. & BERNARD, R. L., 1967. "Population dynamics of nematodes in fields planted to soybeans and crops grown in rotation with soybeans. I. The genus *Pratylenchus* (Nemata: Tylenchida)." *J. econ. Ent.*, 60 (2), 405-410.

The influence of crop species on the soil populations of *Pratylenchus hexincisus*, *P. scribneri*, *P. neglectus* and *P. penetrans* was studied for 5 years in 16 fields rotated to maize, soy-beans, oats, wheat and forage mixtures. Each field was sampled each year between mid-July and mid-August. The populations of *P. hexincisus*, *P. scribneri* and *P. penetrans* increased in soil in which maize was growing. Populations of *P. penetrans*, *P. scribneri* and *P. neglectus* increased in soils in which soy-beans were growing. *P. hexincisus* and *P. neglectus* were capable of producing moderate populations on oats. *P. neglectus* was the only species which increased its numbers on wheat. *P. scribneri* was found in moderate numbers in fields containing forage mixtures of lucerne, red clover and brome-grass.
[A.S.] D.W.L.

—FERRIS, V. R., FERRIS, J. M. & BERNARD, R. L., 1967. "Relative competitiveness of two species of *Pratylenchus* in soybeans." [Abstract.] *Nematologica*, 13 (1), 143.

—MILLER, L. I., 1967. "Comparison of the pathogenicity and development of the Va. 2 isolate of *Heterodera glycines* on Pickett and Lee soybeans." [Abstract.] *Phytopathology*, 57 (7), 647.

—PERRY, V. G., SMART, Jr., G. C. & MULLIN, R. S., 1967. "The soybean cyst nematode, *Heterodera glycines*, found in Florida." *Pl. Dis. Repr.*, 51 (12), 1066.

Heterodera glycines on soy-bean is reported for the first time in Florida, U.S.A. J.B.

—ROSS, J. P., NUSBAUM, C. J. & HIRSCHMANN, H., 1967. "Soybean yield reduction by lesion, stunt, and spiral nematodes." [Abstract.] *Phytopathology*, 57 (5), 463-464.

—SHAVROV, G. N., 1967. [New species of *Aphelenchus* Bastian, 1865 (Nematoda: Aphelenchidae).] *Zool. Zh.*, 46 (2), 278-279. [In Russian: English summary p. 279.]

Females of *Aphelenchus tumidicaudatus* n.sp. were found in the stems and roots of and soil adjacent to *Glycine hispida* in the Primorsk region of far-eastern Russia. The new species is nearest to *A. avenae* but differs from it in that the tail is expanded terminally. G.I.P.

—SHAVROV, G. N., 1967. [Three new species of *Aphelenchoides* Fischer, 1894 (Nematoda: Aphelenchoididae).] *Zool. Zh.*, 46 (5), 762-764. [In Russian: English summary p. 764.]

3 new species of *Aphelenchoides* are described from the roots and soil around the roots of *Glycine hispida* in the Primorsk region in the Russian Far East. *A. parabicaudatus* n.sp. is characterized by a compound mucro and is similar to *A. bicaudatus* but differs in the structure of the buccal capsule, stylet length (8 μ) and the position of the excretory pore and nerve ring. *A. editocaputis* n.sp. has a single mucro and a short post-vulval uterine sac and differs from *A. spinosus* by the shape of the tail, buccal capsule and ovary and the position of the excretory pore and nerve ring. *A. parasubtenuis* n.sp. has a simple mucro and differs from *A. subtenuis* by the body size and proportions, shape of buccal capsule and the shape and size of the genital system. G.I.P.

—TOMERLIN, A. H. & PERRY, V. G., 1967. "Pathogenicity of *Belonolaimus longicaudatus* to three varieties of soybean." [Abstract] *Nematologica*, 13 (1), 154.

- BRYANT, W. E. & WYLLIE, T. D., 1968. "Effect of temperature and variety on nematode development and gall production on soybeans infected with *Meloidogyne incognita acrita*." [Abstract.] *Phytopathology*, 58 (8), 1045.
- FASSULIOTIS, G., RAU, G. J. & SMITH, F. H., 1968. "*Hoplolaimus columbus*, a nematode parasite associated with cotton and soybeans in South Carolina." *Pl. Dis. Repr.*, 52 (7), 571-572. *Hoplolaimus columbus* was found associated with severe damage of cotton and soybeans in South Carolina, USA. Glasshouse host range tests showed that sweet corn variety Golden Security, snap bean variety Extender, lima bean variety Henderson and tomato variety Homestead are suitable hosts for *H. columbus*. J.B.
- JOHNSON, A. W. & NUSBAUM, C. J., 1968. "The activity of *Tylenchorhynchus claytoni*, *Trichodorus christei*, *Pratylenchus brachyurus*, *P. zaei* and *Helicotylenchus dihystra* in single and multiple inoculations on corn and soybean." [Abstract.] *Nematologica*, 14 (1), 9.
- PARK, J. S. & HAN, S. C., 1968. [Studies on the resistant varieties to the soybean cyst nematode, *Heterodera glycines* Ichinohe.] *Res. Rep. Off. rur. Dev., Korea*, 11 (3), 67-73. [In Korean: English summary p. 72.] Root cyst counts were used to assess the resistance of 41 soybean varieties to *Heterodera glycines* (yellow dwarf disease) in trials in Korea. In order of resistance the varieties were PI-90763, PI-84751, Medium-green, Haman, Jacrae, Buseok, L9-673, Changdan-backmok was more resistant than most other Korean recommended varieties. Late maturing varieties were more resistant than early or medium ones. [From English summary.] P.S.G.
- REBOIS, R. V. & CAIRNS, E. J., 1968. "Nematodes associated with soybeans in Alabama, Florida, and Georgia." *Pl. Dis. Repr.*, 52 (1), 40-44. Soil samples from soy-bean fields and from new fields previously wooded in 28 counties in Alabama, northern Florida and Georgia, U.S.A., were examined for nematodes. The results were analysed qualitatively and quantitatively. Over 50 species were recovered and the most common was *Helicotylenchus dihystra*. In one instance *Pratylenchus penetrans* or *Hoplolaimus galeatus* were thought to be responsible for severe damage. The density of *H. dihystra* varied according to the variety of soy-bean: Hood, which is not resistant to *Meloidogyne*, suffered crop losses of 85% compared to Jackson which is resistant. Soils from woodland areas had the same nematode genera as adjacent soy-bean fields but the numbers of *Helicotylenchus* were greater in the latter. The number of genera and total number of plant nematodes recovered per pint of soil were greater in the lighter-textured soils than in the clay soils. *Scutellonema brachyurum* is newly reported on soy-bean. S.W.A.
- REBOIS, R. V., JOHNSON, W. C. & CAIRNS, E. J., 1968. "Resistance in soybeans, *Glycine max* L. Merr., to the reniform nematode." *Crop Sci.*, 8, 394-395. In a pot experiment soybean varieties Pickett and Hyer were resistant to *Rotylenchulus reniformis* and caused reduction in its numbers. Soybean varieties resistant to *Meloidogyne* spp. were not necessarily resistant to *R. reniformis* while varieties resistant to *Heterodera glycines* were resistant to *R. reniformis*. J.B.
- SHAVROV, G. N., 1968. [New species of *Paraphelenchus* (Micoletzky, 1922) Micoletzky, 1925 (Nematoda, Aphelenchinae).] *Soobshch. dal'nevost. Fil. V. L. Komarova sib. Otdel. Akad. Nauk SSSR*, No. 26, pp. 135-136. [In Russian.] *Paraphelenchus octolineatus* n.sp. females are described from around soybean in Primorsk, USSR. It resembles *P. tritici* in having no mucro but differs in the dorsally curved tail, in the large oval rectal bulb and in the structure of the preuteran gland. The spermatheca were filled with sperm. E.L.K.
- SHAVROV, G. N., 1968. [New species of plant nematodes of the subfamily Acrobelinae Thorne, 1937.] *Soobshch. dal'nevost. Fil. V. L. Komarova sib. Otdel. Akad. Nauk SSSR*, No. 26, pp. 137-140. [In Russian.] Females of 2 new species of Acrobelinae are described and figured from around soybean in Primorsk, USSR. *Chiloplacus quinilineatus* n.sp. resembles *C. propinquus* and *C. symmetricus*, but differs in the structure of cephalic and labial probolae, the "a" value and in having 5 lateral lines. *Acrobeloides rectiprocerus* n.sp. is similar to *A. setosus* and *A. sexlineatus*, but differs from the former in the structure of cephalic probolae, in having a longer rectum, 4 lateral lines and a smooth rounded tail tip. It differs from *A. sexlineatus* in the structure of the probolae and in the number of lateral lines. E.L.K.
- SHAVROV, G. N., 1968. [Study of the plant nematode fauna of soy-beans in the Primorskiy Kray.] *Soobshch. dal'nevost. Fil. V. L. Komarova sib. Otdel. Akad. Nauk SSSR*, No. 26, pp. 141-144. [In Russian.] A list of 84 nematode species associated with soybean in 13 districts in Primorsk, USSR, contains 16 species not recorded formerly in this country. 7 species new for science are named. *Heterodera glycines* was not found. E.L.K.
- SUGIYAMA, S. ET AL, 1968 [Studies on the resistance of soya-bean varieties to *Heterodera glycines*. II. Difference of physiological strains of the nematode from Kariwano and Kikyo-gahara.] *Jap. J. Breed.*, 18 (4), 206-212. [In Japanese: English summary p. 212.] A population of *Heterodera glycines* from Kikyo-gahara, Japan, was more pathogenic to soybean than a population from Kariwano, Japan. This is probably due to the nematode populations being of different physiological strains. J.B.
- SUGIYAMA, S. & HIROMA, K., 1968. [Studies on the resistance of soya-bean varieties to *Heterodera glycines*. I. Intervarietal differences in resistance.] *Jap. J. Breed.*, 18 (2), 80-87. [In Japanese: English summary pp. 86-87.] Experiments on the resistance of soybean varieties to *Heterodera glycines* led to the classification of resistance into that of the type of the variety Peking and that of the type of the variety Gedenshirazu. The varieties of the Peking type were the more resistant to attack by *H. glycines*. J.B.
- TAYLOR, D. P., EDWARDS, D. I. & MALEK, R. B., 1968. "The soybean cyst nematode spreads through southern Illinois." *Illinois Res.*, 10 (4), 12-13.

—BRYANT, W. E. & WYLLIE, T. D., 1968. "Effect of temperature and variety on nematode development and gall production on soybeans infected with *Meloidogyne incognita acrita*." [Abstract.] *Phytopathology*, 58 (8), 10-15.

—FASSULIOTIS, G., RAU, G. J. & SMITH, F. H., 1968. "*Hoplolaimus columbus*, a nematode parasite associated with cotton and soybeans in South Carolina." *Pl. Dis. Repr.*, 52 (7), 571-572. *Hoplolaimus columbus* was found associated with severe damage of cotton and soybeans in South Carolina, USA. Glasshouse host range tests showed that sweet corn variety Golden Security, snap bean variety Extender, lima bean variety Henderson and tomato variety Homestead are suitable hosts for *H. columbus*. J.B.

—JOHNSON, A. W. & NUSBAUM, C. J., 1968. "The activity of *Tylenchorhynchus claytoni*, *Trichodorus christei*, *Pratylenchus brachyurus*, *P. zeae* and *Helicotylenchus dihystrera* in single and multiple inoculations on corn and soybean." [Abstract.] *Nematologica*, 14 (1), 9.

—PARK, J. S. & HAN, S. C., 1968. [Studies on the resistant varieties to the soybean cyst nematode, *Heterodera glycines* Ichinohe.] *Res. Rep. Off. rur. Dev., Korea*, 11 (3), 67-73. [In Korean: English summary p. 72.] Root cyst counts were used to assess the resistance of 41 soybean varieties to *Heterodera glycines* (yellow-warf disease) in trials in Korea. In order of resistance the varieties were PI-90763, PI-84751, medium-green, Haman, Jaerae, Buseok, L9-673. Changdan-baekmok was more resistant than most other Korean recommended varieties. Late maturing varieties were more resistant than early or medium ones. [From English summary.] P.S.G.

—REBOIS, R. V. & CAIRNS, E. J., 1968. "Nematodes associated with soybeans in Alabama, Florida, and Georgia." *Pl. Dis. Repr.*, 52 (1), 40-44.

Soil samples from soy-bean fields and from new fields previously wooded in 28 counties in Alabama, northern Florida and Georgia, U.S.A., were examined for nematodes. The results were analysed qualitatively and quantitatively. Over 50 species were recovered and the most common was *Helicotylenchus dihystrera*. In one instance *Pratylenchus penetrans* or *Hoplolaimus galeatus* were thought to be responsible for severe damage. The density of *H. dihystrera* varied according to the variety of soy-bean: Hood, which is not resistant to *Meloidogyne*, suffered crop losses of 85% compared to Jackson which is resistant. Soils from woodland areas had the same nematode genera as adjacent soy-bean fields but the numbers of *Helicotylenchus* were greater in the latter. The number of genera and total number of plant nematodes recovered per pint of soil were greater in the lighter-textured soils than in the clay soils. *Scutellonema brachyurum* is newly reported on soy-bean. S.W.A.

—REBOIS, R. V., JOHNSON, W. C. & CAIRNS, E. J., 1968. "Resistance in soybeans, *Glycine max* L. Merr., to the reniform nematode." *Crop Sci.*, 8, 394-395.

In a pot experiment soybean varieties Pickett and Oyer were resistant to *Rotylenchulus reniformis* and caused reduction in its numbers. Soybean varieties resistant to *Meloidogyne* spp. were not necessarily resistant to *R. reniformis* while varieties resistant to *Heterodera glycines* were resistant to *R. reniformis*. I.B.

—SHAVROV, G. N., 1968. [New species of *Paraphelenchus* (Micoletzky, 1922) Micoletzky, 1925 (Nematoda, Aphelenchinae).] *Soobshch. dal'nevost. Fil. V. L. Komarova sib. Otdel. Akad. Nauk SSSR*, No. 26, pp. 135-136. [In Russian.]

Paraphelenchus octolineatus n.sp. females are described from around soybean in Primorsk, USSR. It resembles *P. tritici* in having no mucro but differs in the dorsally curved tail, in the large oval rectal bulb and in the structure of the preuterine gland. The spermatheca were filled with sperm. E.L.K.

—SHAVROV, G. N., 1968. [New species of plant nematodes of the subfamily Acrobelinae Thorne, 1937.] *Soobshch. dal'nevost. Fil. V. L. Komarova sib. Otdel. Akad. Nauk SSSR*, No. 26, pp. 137-140. [In Russian.]

Females of 2 new species of Acrobelinae are described and figured from around soybean in Primorsk, USSR. *Chiloplacus quinilineatus* n.sp. resembles *C. propinquus* and *C. symmetricus*, but differs in the structure of cephalic and labial probolae, the "a" value and in having 5 lateral lines. *Acrobeloides rectiprocerus* n.sp. is similar to *A. setosus* and *A. sexlineatus*, but differs from the former in the structure of cephalic probolae, in having a longer rectum, 4 lateral lines and a smooth rounded tail tip. It differs from *A. sexlineatus* in the structure of the probolae and in the number of lateral lines. E.L.K.

—SHAVROV, G. N., 1968. [Study of the plant nematode fauna of soy-beans in the Primorskiy Krai.] *Soobshch. dal'nevost. Fil. V. L. Komarova sib. Otdel. Akad. Nauk SSSR*, No. 26, pp. 141-144. [In Russian.]

A list of 84 nematode species associated with soybean in 13 districts in Primorsk, USSR, contains 16 species not recorded formerly in this country. 7 species new for science are named. *Heterodera glycines* was not found. E.L.K.

—SUGIYAMA, S. ET AL, 1968 [Studies on the resistance of soya-bean varieties to *Heterodera glycines*. II. Difference of physiological strains of the nematode from Kariwano and Kikyo-gahara.] *Jap. J. Breed.*, 18 (4), 206-212. [In Japanese: English summary p. 212.]

A population of *Heterodera glycines* from Kikyo-gahara, Japan, was more pathogenic to soybean than a population from Kariwano, Japan. This is probably due to the nematode populations being of different physiological strains. J.B.

—SUGIYAMA, S. & HIROMA, K., 1968. [Studies on the resistance of soya-bean varieties to *Heterodera glycines*. I. Intervarietal differences in resistance.] *Jap. J. Breed.*, 18 (2), 80-87. [In Japanese: English summary pp. 86-87.]

Experiments on the resistance of soybean varieties to *Heterodera glycines* led to the classification of resistance into that of the type of the variety Peking and that of the type of the variety Gedenshirazu. The varieties of the Peking type were the more resistant to attack by *H. glycines*. J.B.

—TAYLOR, D. P., EDWARDS, D. I. & MALEK, R. B., 1968. "The soybean cyst nematode spreads through southern Illinois." *Illinois Res.*, 10 (4), 12-13.

-MARTIN, G. C., JAMES, G. L., BISSETT, J. L. & WAY, J. I., 1969. "Trials with field crops and *Radopholus similis* with observations on *Pratylenchus* sp., *Meloidogyne* sp. and other plant parasitic nematodes." *Rhod. J. agric. Res.*, 7 (2), 149-157.

groundnut, lemon, maize, tobacco, potato, rice, wheat, cotton, soybean, sugar cane and tea were planted close to the pseudostems of bananas (var. Dwarf Cavendish), the roots of which were heavily infected with *Radopholus similis*. With the exception of the lemon seedlings, *R. similis* was recovered from the roots of all the crops grown in the trial. The race of *R. similis* present is considered to be a most serious parasite of groundnuts, most of the underground parts of which were heavily invaded. *R. similis* did not survive in infected groundnut roots for longer than 50 days under normal storage conditions. *Pratylenchus* sp., *Meloidogyne* sp., *Helicotylenchus* sp., *Aphelenchoides* sp., *Aphelenchus* sp., *Ditylenchus* sp., *Tylenchus* sp., *Rotylenchus* sp., and *Scutellonema* sp. were recovered from blended root tissue. [A.S.] J.E.P.

-ORTUÑO MARTÍNEZ, A., GÓMEZ GÓMEZ, J. & CÁNOVAS CANDEL, F., 1969. "Poblaciones nematológicas fitoparásitas en los suelos de la huerta de Murcia." *An. Edafol. Agrobiol.*, 28, 389-397. [English summary p. 389.]

The 8 commonest genera of plant-parasitic nematodes found in the plain of Murcia, Spain, where citrus, stone fruits, corn and vegetables are intensively cultivated, were studied. There were great differences between the population densities of *Tylenchulus* and those of *Tylenchorhynchus*, *Pratylenchus*, *Helicotylenchus*, *Paratylenchus*, *Xiphinema*, *Cricemoides* and *Meloidogyne*. Important foci were found which should be taken into account both in fertilization practices and in phytosanitary controls. [From English summary.] M.T.F.

-ORTUÑO MARTÍNEZ, A., GÓMEZ GÓMEZ, J. & CÁNOVAS CANDEL, F., 1969. "Distribución de las poblaciones de *Tylenchulus semipenetrans* en plantaciones citricolas de la Huerta de Murcia, relacionadas con la textura del suelo y nivel freático." *An. Edafol. Agrobiol.*, 28, 623-630. [English summary p. 623.]

The population levels of *Tylenchulus semipenetrans* in citrus orchards in the plain of Murcia, Spain, have been studied in relation to soil texture and the water table. Population densities were 40,000 or more per kg. of soil in 3.9% of plantations, with 81.6% under 10,000 and 18.4% above 10,000. The frequent occurrence of populations of this nematode in soils used for growing *Citrus aurantium* seedlings is the main means of infestation of new developments in citrus-growing areas. [From English summary.] M.T.F.

-PHILLIPS, D. V. & BARKER, K. R., 1969. "Responses in growth and yield of soybeans to several population levels and combinations of certain nematodes." [Abstract.] *J. Nematol.*, 1 (1), 23.

-ROSS, J. P., 1969. "Effect of *Heterodera glycines* on yields of nonnodulating soybeans grown at various nitrogen levels." *J. Nematol.*, 1 (1), 40-42.

The addition of nitrogen in the form of NaNO_3 to plots of non-nodulating soybean infected with *Heterodera glycines* reduced yield losses when compared to untreated infected plots. The results indicate that besides reducing root nodulation and N fixation, *H. glycines* causes soybean yield reductions by inciting deleterious host responses that increase with N deficiency. J.B.

-SMART, Jr., G. C., DICKERSON, O. J. & SMITH, R. L., 1969. "Reproduction of the soybean cyst nematode on 'Pickett', 'Dyer' and 'Hampton' soybeans." *Proc. Soil Crop Sci. Soc. Fla.*, Year 1968, 28, 306-309.

In a trial comparing the resistant soybean varieties Pickett and Dyer with the susceptible variety Hampton for their reaction to the population of *Heterodera glycines* present near Cantonment, Florida, USA, the resistant varieties proved highly resistant while Hampton was heavily infested. Rotation is recommended to reduce the danger of the development of a nematode biotype capable of reproducing on the resistant soybeans. M.T.F.

-SPEARS, J. F., 1969. "Organized nematode control programmes in the USA." In: Peachey, J. E. [Editor], "Nematodes of tropical crops." *Tech. Commun. Commonw. Bur. Helminth.*, No. 40, pp. 314-323.

The need for integrated control measures in combating nematode diseases of plants is stressed using *Radopholus similis* on citrus in Florida, USA, *Heterodera rostochiensis* on potato in New York, USA and *H. glycines* on soybean in the Americas as examples. J.B.

-VEECH, J. A. & ENDO, B. Y., 1969. "The histochemical localization of several enzymes of soybeans infected with the root-knot nematode *Meloidogyne incognita acrita*." *J. Nematol.*, 1 (3), 265-276.

In soybeans infected with *Meloidogyne incognita acrita*, 3 phosphatases, esterase, peroxidase and cytochrome oxidase were found to be more active around the sites of infection. J.B.

--- -VEECH, J. A. & ENDO, B. Y., 1969. "Alterations in enzyme localization in soybeans infected with *Meloidogyne incognita acrita*." [Abstract.] *J. Nematol.*, 1 (4), 307-308.

--- -ANON., 1970. [Report on the breeding of the new soybean varieties Raiden and Raiko by means of irradiation.] *Bull. Tohoku agric. Exp. Sta.*, No. 40, pp. 65-105. [Ja] [Heterodera glycines-tolerant.]

--- -BARKER, K. R. & HUISINGH, D., 1970. "Histological investigations of the antagonistic interaction between *Heterodera glycines* and *Rhizobium japonicum* on soybean." [Abstract.] *Phytopathology*, 60 (9), 1282-1283.

--- -BURNS, N. & NORTON, D. C., 1970. "Influence of soil pH on nematode populations associated with soybeans." [Abstract.] *J. Parasit.*, 56 (4, Sect. 2), (Int. Congr. Parasit. (2nd), Washington, D.C., Sept. 6-12, 1970, Proceedings, Part I), p. 43.

--- -EDWARDS, D. I.; SIKORA, R. A., 1970. "An evaluation of nematocides for control of the soybean cyst nematode." [Abstract.] *International Congress of Plant Protection (7th)*, Paris, Sept. 21-25, 1970. Summaries of papers, pp. 196-197. [En] [Heterodera glycines on soybeans, control by Mocap and Rotox.]

—ENDO, B. Y., 1970. "Nucleic acid synthesis at infection sites of soybeans invaded by soybean cyst nematode." [Abstract.] *Phytopathology*, 60 (6), 1014.

—ENDO, B. Y. & VEECH, J. A., 1970. "Morphology and histochemistry of soybean roots infected with *Heterodera glycines*." *Phytopathology*, 60 (10), 1493-1498.

Morphological and histochemical changes in the roots of soybean infected by *Heterodera glycines* were studied. Both resistant (Pickett) and susceptible (Lee) cultivars initially responded in the same way. Syncytia were common and extensive in the susceptible host. High levels of enzyme activity were found in and around syncytia but in the resistant host the increased enzyme activity stopped shortly after the syncytia were initiated. In the resistant host, syncytia became necrotic and deteriorated. Cortical necrosis occurred in both hosts as a result of larval migration. Results are discussed in relation to those of similar studies on *Meloidogyne incognita* infection of soybean. C.E.S.

—EPPS, J. M., 1970. "Breeding soybeans for resistance to the soybean cyst nematode, *Heterodera glycines* and the root-knot nematode, *Meloidogyne* spp." [Abstract.] *International Nematology Symposium (10th), European Society of Nematologists, Pescara, 8-13 Sept., 1970. Summaries*, pp. 109-110. [Also in French, German & Italian.]

—EPPS, J. M., 1970. "Field and greenhouse evaluations of nematicide for soybean cyst nematode control." [Abstract.] *Phytopathology*, 60 (4), 583.

—EPPS, J. M. & DUCLOS, L. A., 1970. "Races of the soybean cyst nematode in Missouri and Tennessee." *Pl. Dis. Reptr.*, 54 (4), 319-320. *Heterodera glycines* obtained from Scott County, Missouri, USA, was used to inoculate plants of Pickett, Dyer, Custer, Peking, Hill, Scott, PI 90763, and Lee, varieties of soybean formerly considered resistant to the nematode. In all cases reproduction took place. Strains of *H. glycines* from Arkansas, Missouri and Tennessee though morphologically indistinguishable from others may be differentiated on the basis of their ability to develop on the resistant varieties. K.J.O.W.

—GILBERT, J. C.; CHINN, J. T.; TANAKA, J. S., 1970. "Four new tropical vegetable-type soybeans with root-knot nematode resistance." *Research Report, Hawaii Agricultural Experiment Station*, No. 178, 7 pp. [En] Descriptions are given of 4 new soybean varieties resistant to *Meloidogyne* sp. in Hawaii. [From *Plant Breeding Abstracts*, 42, No. 1593.] M.T.F.

—GOLDEN, A. M. ET AL., 1970. "Terminology and identity of intraspecific forms of the soybean cyst nematode (*Heterodera glycines*)." *Pl. Dis. Reptr.*, 54 (7), 544-546. The term "race" is preferred to "isolate", "physiological strain" or "biotype" for the designation of specific forms of *Heterodera glycines*. 4 races of nematode known to occur in the USA are characterized by differences in ability to reproduce on varieties of soybean. M.R.S.

—GUIRAN, G. DE, 1970. "Le problème *Meloidogyne* sur tabac à Madagascar." *Cah. O.R.S.T.O.M., Sér. Biol.*, No. 11, pp. 187-208. [English summary pp. 187-188.]

In Madagascar, tobacco grown in small fields in the highlands by peasant farmers is attacked by *Meloidogyne javanica* while in large-scale cultivation in the lowlands of the west coast it is infested with *M. incognita*. In coastal areas with heavy soil, flooding in the rainy season and subsequent drying of the soil in the dry season keeps infestation light, but infested seed-beds are a source of re-infestation. Various control methods are discussed and the results given of tests of 6 nematode populations against 10 plant species that could be used in rotations with tobacco. Groundnut, soybean and *Cenchrus ciliaris* were highly resistant. On *Crotalaria fulva*, *C. grahamiana* and *Stylosanthes gracilis*, a few immature females were found but very few larvae were produced: these plants could be used in rotations but should be checked for possible build up of an aggressive biotype of the nematode.

Brachiaria ruziziensis and *Eragrostis chloromelas* were moderately resistant but supported maintenance populations. *Lablab niger* and *Melinis minutiflora* were highly susceptible to all 6 populations. M.T.F.

—HARTWIG, E. E. & EPPS, J. M., 1970. "An additional gene for resistance to the soybean cyst nematode, *Heterodera glycines*." [Abstract.] *Phytopathology*, 60 (4), 584

—LEHMAN, P. S., BARKER, K. R. & HUISINGH, D., 1970. "The effect of races of *Heterodera glycines* on nodulation and nitrogen fixation in soybean." [Abstract.] *Phytopathology*, 60 (9), 1299-1300.

—MILLER, L. I., 1970. "Differentiation of eleven isolates as races of the soybean cyst nematode." [Abstract.] *Phytopathology*, 60 (6), 1016.

—REBOIS, R. V., 1970. "Effect of soil temperature and moisture on infectivity and development of *Rotylenchulus reniformis* on soybeans, *Glycine max* L. Merr." [Abstract.] *J. Parasit.*, 56 (4, Sect. 2), (Int. Congr. Parasit. (2nd), Washington, D.C., Sept. 6-12, 1970. Proceedings, Part I), p. 278.

—REBOIS, R. V., EPPS, J. M. & HARTWIG, E. E., 1970. "Correlation of resistance in soybeans to *Heterodera glycines* and *Rotylenchulus reniformis*." *Phytopathology*, 60 (4), 695-700.

All *Heterodera glycines* resistant soybean cultivars tested were also resistant to *Rotylenchulus reniformis*. Resistance of Dyer, Custer and Pickett is derived from Peking. D66-12394, D66-12392 and 2 F₄ cultivars of PI90763 × Hill crosses also carry genes for resistance to both nematodes. Resistant cultivars are attacked by *R. reniformis* larvae, but female development is subsequently inhibited. Histological effects of parasitism of female *R. reniformis* on Lee soybean closely resembles those reported with *H. glycines*. The histology of susceptible and resistant soybeans to *R. reniformis* was studied. No relationship was established between *R. reniformis* and *Meloidogyne incognita* resistance in soybeans. This is the first report in which a crop has been shown to have a common genetic source of resistance to nematodes from different genera. It is also the first report showing the histology of parasitism by *reniformis* on soybeans. [A.S.] J.E.P.

—RHODESIA, 1970. "Report of the Secretary for Agriculture, 1968-69." Salisbury: Government Printer, 82 pp. [Plant nematodes p. 30.]

A survey of the distribution of *Radopholus similis* on banana in Rhodesia revealed a number of infested sites, mainly in the Lowveld. Sugar-cane, maize, rice, wheat, tobacco, soybean, potato and groundnut also act as hosts, the last-named often being seriously affected. Fumigation trials on 40 farms indicated that nematodes are not generally of economic significance in cotton production, but *Trichodorus* sp. and *Pratylenchus brachyurus* can cause serious damage to cotton and maize. B.G.

—TOBAR JIMÉNEZ, A., 1970. "Descripción de dos nuevas especies del género *Tylenchorhynchus* Cobb, 1913 (Nematoda: Tylenchidae), con algunos datos adicionales sobre el *T. sulcatus* de Guirán, 1967." *Revta ibér. Parasit.*, 30 (2/3), 257-270. [English summary pp. 257-258.]

Tylenchorhynchus acrolatus n.sp. and *T. alboranensis* n.sp. from around the roots of *Frankenia corymbosa*, *Senecio alboranicus* and possibly *Mesembryanthemum nodiflorum* (*T. acrolatus* also from *Spergularia bocconci*) from the island of Alboran, Spain, are described and figured. *T. acrolatus* is distinguished from *T. aduncus* by its shorter stylet (15.0 to 16.9 μ), the shape of the female tail and by its strongly areolated lateral fields. *T. alboranensis* is distinguished from *T. microdorus* by the form of the labial region, shorter stylet (10.8 to 11.2 μ), shorter body, spicules and gubernaculum. *T. sulcatus* also found on the island on *Diploaxis sicetiana*, *Anacyclus*, *Polycarpon tetraphyllum* and the other plants mentioned above, is described. The relation of these nematodes to the extremely dry sandy soil in which they were found is discussed. *T. sulcatus*, known from Morocco, may have reached Alboran by wind dispersal. P.S.G.

—USA, 1970. "83rd Annual Report, Fiscal Year ending June 30, 1970, Mississippi Agricultural and Forestry Experiment Station." *Mississippi Agricultural and Forestry Experiment Station*: 126 pp. [Plant nematology pp. 39, 50-51, 74, 98.] [En]

Mention is made of the development of root-knot resistant varieties of tomato, pepper, red clover, cotton and soybean. Resistance is combined with tolerance to fungal diseases in cotton and soybean and to tobacco mosaic virus in pepper. Resistance to cyst nematode also is incorporated in soybean. Experiments with a range of nematicides for use against root-knot nematodes on okra, bean, cucurbits and sweet potato are briefly reported. M.T.F.

—VEECH, J. A. & ENDO, B. Y., 1970. "Comparative morphology and enzyme histochemistry in root knot resistant and susceptible soybeans." *Phytopathology*, 60 (5), 896-902.

A comparison was made of certain enzyme histochemical and morphological responses of susceptible (Lee) and resistant (Delmar) soybeans to infection by *Meloidogyne incognita acrita*. The activity of certain oxido-reductive, hydrolytic and oxidative enzymes of the susceptible variety were increased significantly primarily within the syncytium. Initially, galling response to infection was

similar in both susceptible and resistant plants, i.e., slight galling was observed prior to the microscopic detection of syncytia. During the first few days after inoculation, both cultivars showed a similar, slight increase of host enzyme activity at the nematode feeding site. With further disease development, however, the responses of the 2 cultivars differed. In the susceptible host, syncytia developed at the site of nematode feeding into extensive units that contained increased levels of enzyme activity. The syncytia usually were sufficient to support the development of the nematode to maturity. At a time corresponding to syncytia induction in the susceptible host, the most common response in the resistant host was cell necrosis. Often after inducing necrosis, the nematode migrated to non-necrotic cells and commenced feeding; these cells subsequently became necrotic. An increase in enzyme activity was seldom found in resistant host cells associated with nematode feeding. Unlike the susceptible plant response to the nematode, the resistant plant rarely produced syncytia. In rare cases however, where the nematode induced syncytia in the resistant plant, the syncytia contained increased levels of enzyme activity.

[A.S.] J.B.P.

—BALASUBRAMANIAN, M., 1971. "Root-knot nematodes and bacterial nodulation in soybean." [Correspondence.] *Curr. Sci.*, 40 (3), 69-70.

In experiments, bacterial nodulation of soybean roots by *Rhizobium japonicum* was less in the presence of *Meloidogyne javanica*, *M. hapla* and *M. incognita* than in their absence. Greatest reduction was with *M. javanica* but there was no difference between inoculations with 100 and 1,000 larvae.

M.T.F.

—BARKER, K. R.; LEHMAN, P. S.; HUISINGH, D., 1971. "Influence of nitrogen and *Rhizobium japonicum* on the activity of *Heterodera glycines*." *Nematologica*, 17 (3), 377-385. [En, de] Dept. of Plant Pathology, North Carolina State Univ., Raleigh, N. Carolina, USA.

The effects of source and concentration of nitrogen on the hatching, penetration and development of *Heterodera glycines* on soybean plants in the presence of *Rhizobium japonicum* was investigated. The effects of *H. glycines* on nodulating and non-nodulating lines of soybeans in the presence or absence of nitrogen and *R. japonicum* was also studied. In glasshouse experiments the application of 56 to 896 p.p.m. nitrogen as NaNO_3 or NH_4NO_3 to soybean plants grown in soil or silica sand reduced hatching, penetration of roots, and cyst development of *H. glycines*. Tests with sodium chloride showed that this was not due to osmotic changes. Inoculation with *Rhizobium* also interfered with nematode development. Nodulating and non-nodulating isogenic lines of soybean plants inoculated with *R. japonicum* and *H. glycines* showed less cyst development than those inoculated with *H. glycines* alone.

C.E.S.

—BIRCHFIELD, W.; WILLIAMS, C.; HARTWIG, E. E.; BRISTER, L. R., 1971. "Reniform nematode resistance in soybeans." *Pl. Dis. Repr.*, 55 (12), 1043-1045. [En] Plant Science Research Div., Agricultural Research Service, USDA, Louisiana State Univ., Baton Rouge, USA.

Resistance to *Rotylenchus reniformis* was studied in 20 new breeding lines and cultivars of soybean. 7

(continued overleaf)

es were classed as resistant, 4 as moderately resistant and 9 as susceptible. All lines in the resistant and moderately resistant classes, and 4 in the susceptible, are also resistant to *Heterodera glycines*. It is suggested that separate but probably linked genes give resistance to the cyst and reniform nematodes. M.T.F.

-BURNS, N. C., 1971. "Soil pH effects on nematode populations associated with soybeans." *Nematol.*, 3 (3), 238-245.

soy soybeans were grown for 2 months in non-limed Jackson silt loam amended to pH 4.0, 6.0 and 8.0. Nematodes were extracted bi-weekly from soil and roots. The greatest numbers of *Tylenchus alleni* colonized soybean roots at pH 6.0. *Hoplolaimus galeatus* and members of the Dorylaiminae-Psilenchinae survived best at pH 6.0. The numbers of the Dorylaimoidea were greatest at pH 6.0 and 8.0. The non-stylet nematodes were recovered in greater numbers from pH 8.0. Concentrations of potassium, manganese and molybdenum were highest in soybean plants grown in pH 4.0 soil, the pH at which nematodes were fewest. Thicker suberized outer layer of root tissue occurred in plants grown at pH 4.0. [A.S.] M.T.F.

-COLLINS, R. J.; RODRIGUEZ-KABANA, J. M., 1971. "Relationship of fertilizer treatments and crop sequence to populations of lesion nematodes." [Abstract.] *J. Nematol.*, 3 (4), 306-307. [En] Dept. of Botany and Microbiology, Auburn Univ., Auburn, AL 36830, USA.

major crops maize, soybeans and cotton: nematode species close to *Pratylenchus scribneri*.]

-EDWARDS, D. I.; MALEK, R. B., 1971. "Non-reproduction of *Heterodera lespedezae* on *Heterodera glycines* race differentiating soybean lines." *Pl. Dis. Repr.*, 55 (11), 974-975. [En] Plant Science Research Div., Agricultural Research Service, USDA, Univ. of Illinois, Urbana-Champaign, Urbana, Illinois, USA.

the lespedeza cyst nematode *Heterodera lespedezae* was tested on 8 soybean varieties to confirm that it does not attack lines of soybean used to classify the soybean cyst nematode *Heterodera glycines*. Soybean variety dark-63, a variety highly susceptible to *H. glycines* but nonsusceptible to *H. lespedezae*, was used to check the purity of the inoculum. *Lepedeza striata* var. Kobe was used to check the infectivity of the *H. lespedezae* inoculum. Plants were grown in sterilized soil and each pot was inoculated with 50 hand-picked brown cysts of uniform size. No reproduction of *H. lespedezae* occurred on any soybean variety tested and only a few dark brown cysts were recovered from the soil. C.E.S.

-ENDO, B. Y., 1971. "Synthesis of nucleic acids at infection sites of soybean roots parasitized by *Heterodera glycines*." *Phytopathology*, 61 (4), 395-399.

syncytia induced in soybean roots by *Heterodera glycines* are characterized by the presence of numerous enlarged nuclei in a mass of dense cytoplasm. Nuclei were over 3 times normal diameter 12 to 15 days after inoculation but after 30 days had shrunk. Nucleoli were similarly affected. Syncytial nuclei were relatively quiescent in terms of DNA synthesis. However, tritiated thymidine was incorporated in nuclei of syncytia in the cortical and vascular regions of infected roots. The leading edge of the developing syncytium was found to be the primary site of DNA synthesis as indicated by the high H^3 -methyl-thymidine K.I.O.W.

-FERRIS, V. R. & BERNARD, R. L., 1971. "Crop rotation effects on population densities of ectoparasitic nematodes." *J. Nematol.*, 3 (2), 119-122.

Mid-season counts were made over a 5-year period of 5 species of ectoparasitic nematodes, *Helicotylenchus pseudorobustus*, *Paratylenchus*, *Tylenchorhynchus martini*, *T. acutus*, and *Xiphinema americanum*, in crop rotations including maize, soybeans, oats, wheat and a forage mixture consisting mainly of lucerne, red clover and brome grass (*Bromus inermis*). *H. pseudorobustus* maintained high densities in all plots except in soybeans not preceded by maize, where densities were low. *P. projectus* occurred in large numbers in the second year of forage and in markedly larger numbers on soybeans not preceded by maize than on soybeans after maize. Numbers of *T. martini* were significantly less in the second year of maize than in the first. Few *T. acutus* were found in any crop.

Populations of *X. americanum* were significantly smaller in the second year of maize than in the first, possibly because, with its long life-history, the effects of the lack of a suitable host plant would be delayed. More knowledge of the effects of crop rotations on the populations of plant-parasitic nematodes, and of the possible damage that the nematodes can do to crops, can be of use in planning the most suitable crop rotations. M.T.F.

-FERRIS, V. R. & BERNARD, R. L., 1971. "Effect of soil type on population densities of nematodes in soybean rotation fields." *J. Nematol.*, 3 (2), 123-128.

Counts made in mid-season for 5 consecutive years of several species of ectoparasitic nematodes in 4 different soil types under a rotation of maize, soybeans, wheat and forage mixtures showed high densities of *Helicotylenchus pseudorobustus* and *Tylenchorhynchus acutus* in dark silty clay loams. It is suggested that dryness of the years in question may have caused the lighter soils to be insufficiently moist for these species. *Paratylenchus projectus* populations were greatest in light-coloured silt loams as compared with darker soils. *Xiphinema americanum* developed equally in all soils and on all crops. *T. martini* was present but did not increase in numbers in any plots. *Pratylenchus* spp. in soil were generally few in number, probably reflecting their endoparasitic habit. M.T.F.

-FERRIS, V. R.; FERRIS, J. M.; BERNARD, R. L.; PROBST, A. H., 1971. "Community structure of plant-parasitic nematodes related to soil types in Illinois and Indiana soybean fields." *J. Nematol.*, 3 (4), 399-408. [En] Dept. of Entomology, Purdue Univ., Lafayette, IN 47907, USA.

Comparisons of plant-parasitic nematode populations using a resemblance equation and community ordination showed that community structure tends to be similar on dark-coloured, highly productive soybean soils throughout Indiana and Illinois, USA. On lighter-coloured soils community structures differed somewhat from those of darker soils and from each other. [A.S.] M.T.F.

-GIPSON, I., KIM, K. S. & RIGGS, R. D., 1971. "An ultrastructural study of syncytium development in soybean roots infected with *Heterodera glycines*." *Phytopathology*, 61 (4), 347-353.

Electron microscope studies of soybean roots were conducted at 42 hours, 4, 7 and 15 days after inoculation with *Heterodera glycines*. Cell wall perforations appearing within 42 hours of inoculation seemed to be responsible for syncytium formation. After 15 days, individual cells were no longer distinguishable, vacuoles had become reduced in size and plastids which had become abundant in the early stages of the syncytium had decreased in number. In older syncytia a parallel arrangement of endoplasmic reticulum-like material was noticeable. Mitosis was observed only once. K.J.O.W.

—HICKEY, K. D. [Editor], 1971. "Fungicide and nematocide tests. Results of 1970." Winchester, Va: American Phytopathological Society, Vol. 26, 196 pp. [Nematodes pp. 152-181, 188-189.]

Brief reports of several hundred trials with new and existing fungicides and nematocides carried out in 1970 are given, grouped by country. An annotated list of materials available for testing in 1971 is given, grouped under the companies producing them. The composition, source and formulation of the more common fungicides and nematocides are listed. Names of nematocides tested and nematodes and hosts concerned will be found in the index. P.S.G.

—KINLOCH, R. A., 1971. "Florida field crops as hosts of the spiral nematode, *Helicotylenchus dihystera*." [Abstract.] *Nematropica*, 1 (2), 38-39, 43-44. [En, Es] Agriculture Research Centre, Jay, Florida 32565, USA.

pot tests *Helicotylenchus dihystera* multiplied on bean, rye, wheat, maize, oats and sorghum. M.T.F.

—KOLIOPANOS, C. N.; TRIANTAPHYLLOU, A. C., 1971. "Host specificity and morphometrics of four populations of *Heterodera glycines* (Nematoda: Heteroderidae)." *J. Nematol.*, 3 (4), 364-368. [En] Dept. of Plant Pathology, North Carolina State Univ., Raleigh, N. Carolina 27607, USA.

Four populations of *Heterodera glycines* from 4 different states of USA differed considerably in numbers of adult females developed on resistant bean cultivars, mungbean (*Phaseolus aureus*) and mameyza. Differences were observed also in body, head and tail terminus lengths of 2nd-stage larvae. An attempt was made to assign these populations to recognized races, and it is suggested that race designations should be applied only to representative samples of field populations and not to selected glasshouse populations or isolates. [A.S.] M.R.S.

—LEHMAN, P. S.; HUISINGH, D.; BARKER, K. R., 1971. "The influence of races of *Heterodera glycines* on nodulation and nitrogen-fixing capacity of soybean." *Phytopathology*, 61 (10), 1239-1244. [En] Dept. of Plant Pathology and Plant Genetics, Univ. of Georgia, Athens 30601, USA.

Three races of *Heterodera glycines* (1, 2 and 4 of Golden *et al.*, 1970), were compared for their effects on nodulation and nitrogen-fixing capacity of Lee soybean. With inocula of 100, 200 and 400 crushed roots of race 1 of *H. glycines* plus *Rhizobium japonicum* there were fewer nodules per g. of root tissue and N-fixing capacity was less than with *R. japonicum* alone. Similar inoculum levels of races 2 and 4 had no effect. Nodule number and weight were inversely proportional to increasing densities of race 1. Infection by race 1 initially increased nodular efficiency (N-fixing capacity) but as the nematode multiplied, efficiency and N-fixing capacity declined. K.J.O.W.

—LINDSEY, D. W.; CAIRNS, E. J., 1971. "Pathogenicity of the lesion nematode, *Pratylenchus brachyurus*, on six soybean cultivars." *J. Nematol.*, 3 (3), 220-226.

Pathogenicity tests of *Pratylenchus brachyurus* on selected glasshouse-grown soybean cultivars indicated the nematode was not that of "Custer" but that of "Pickett". Damage to roots was greater at higher temperatures. Root pruning was prominent in "Hood" and "Pickett", but limited in "Custer" and "Hill". Root pruning was not observed at 13°C. and only "Pickett" showed pruning at 21°C. Plant height and foliage weight were not affected. *P. brachyurus* had no effect on the emergence of "Pickett" or "Bragg" soybeans. Nematode counts from roots of "Pickett" at intervals after inoculation indicated that hatching of second generation 2nd-stage larvae occurred about 15 days after egg laying. An average of 10% of roots were damaged in sectioned roots. In soybean roots infected by *P. brachyurus* and/or *Rhizoctonia solani*, greater damage occurred with nematode and fungus combined than with either acting alone. [A.S.] M.T.F.

—MILLER, L. I., 1971. "Physiologic variation within the Virginia-2 population of *Heterodera glycines*." [Abstract.] *J. Nematol.*, 3 (4), 318. [En] Dept. of Plant Pathology and Physiology, Virginia Polytechnic Inst. and State Univ., Blacksburg, VA 24061, USA.

—MILLER, W. O.; THOMAS, P. A.; NORRIS, M. G., 1971. "Nematode diseases of soybeans and the economics of their control with Fumazone nematocide." *Down to Earth*, 26 (4), 25-27. [En] The Dow Chemical Company, Midland, Michigan, 48640, USA.

From a review of work on nematode control in soybean crops it is concluded that the use of Fumazone 86 is a practical and economical method of treatment. C.E.S.

—NORTON, D. C.; BURNS, N., 1971. "Colonization and sex ratios of *Pratylenchus alleni* in soybean roots under two soil moisture regimes." *J. Nematol.*, 3 (4), 374-377. [En] Dept. of Botany and Plant Pathology, Iowa State Univ., Ames, IA 50010, USA.

Population size and sex ratios of *Pratylenchus alleni* in soybeans were studied under two different moisture regimes in Hagener loamy fine sand from Iowa, USA. Soil moisture was maintained from field capacity to 50% below field capacity in the dry regime and from field capacity to 25% above field capacity in the wet regime. The initial peak of colonization of soybeans by *P. alleni* was in the top 5 cm. of taproot 14 days after seeding. There were more *P. alleni* per unit length of taproot in the dry than in the wet regime during the first 7 days, and this trend continued in the top 5 cm. of the taproot for 21 days. Nematode density was greater in taproots than in fibrous roots. The ratio of males to females recovered from roots was significantly greater in the dry than in the wet regime. [A.S.] M.T.F.

-ORBIN, D. P.; CAIRNS, E. J., 1971. "Histopathology of soybean roots infected with *Helicotylenchus dihystera* (Cobb) Sher." [Abstract.] *J. Nematol.*, 3 (4), 322-323. [En] Dept. of Botany and Microbiology, Auburn Univ., Auburn, AL 36830, USA.

-REBOIS, R. V., 1971. "The effect of *Rotylenchulus reniformis* inoculum levels on yield, nitrogen, potassium, phosphorus and amino acids of seed of resistant and susceptible soybean (*Glycine max*)." [Abstract.] *J. Nematol.*, 3 (4), 326-327. [En] Plant Science Research Div., Agricultural Research Service, USDA, Beltsville, MD 20705, USA.

-ROBBINS, R. T.; BARKER, K. R., 1971. "Reproductive responses of *Belonolaimus longicaudatus* to soil type and temperature." [Abstract.] *J. Nematol.*, 3 (4), 328. [En] Dept. of Plant Pathology, North Carolina State Univ., Raleigh, NC 27606, USA.
greatest reproduction with 80% sand at 30°C.]

-TAYLOR, D. P.; MALEK, R. B.; EDWARDS, D. I., 1971. "The barley root-knot nematode it's not a problem—yet." *Crops Soils*, 23 (6), 14-16.

Following a general account of *Meloidogyne naasi* in the USA, the authors state that they have found that 11 of 47 varieties of oats were not galled by the Illinois isolate of the nematode. In tests, the nematode produced galls and reproduced on soybeans, but it is not known whether yields were reduced; the nematode is not known on this host in the field. M.T.F.

-TRUSKOVA, G. M., 1971. [A new species of *Acrobeloides* (Nematoda, Cephalobidae).] *Zool. Zh.*, 50 (3), 434-436. [In Russian: English summary p. 436.]

An illustrated description is given of *Acrobeloides amurensis* n.sp. from the stems, roots and soil around the roots of *Glycine hispida* in the Amur region of the USSR. The new species differs from the 20 species known in the genus by the large body (0.86 to 1.62 mm.), asymmetrical well-developed lip propodeae, longer (50μ) post-vulval uterine sac and a small number (6 pairs) of papillae on the male tail. G.I.P.

-ZEHR, E. I. [Editor], 1972. "Fungicide and nematicide tests. Results of 1971." *Winchester, Va: American Phytopathological Society*, Volume 27, 206 pp. [En] [Nematology pp. 147, 158-177, 192-193.]

Brief details are given of 36 trials with various nematicides on different host/parasite associations carried out at research stations in the USA and one in Taiwan. The results of each trial are tabulated. New and standard materials available for testing in 1972 from 31 commercial sources are given in an annotated list. A further list of products under trial or in general use gives basic information on their composition and source of supply and includes 41 nematicides. The names of nematicides, plants and nematodes in the 37 trials recorded will be found in the index to this volume. [For abstract of an article in this book, see No. 1166 above.] M.T.F.

-K O L I O P A N O S, C. N.; TRIANTAPHYLLOU, A. C., 1972. "Effect of infection density on sex ratio of *Heterodera glycines*." *Nematologica*, 18 (1), 131-137. [En, de] Dept. of Plant Pathology, North Carolina State Univ., Raleigh 27607, USA.

Approximately equal numbers of males and females of *Heterodera glycines* developed in roots of soybean seedlings at low infection densities. High infection densities significantly increased the male to female ratio, first in the secondary and tertiary roots and then in the primary root. Infection density of secondary roots influenced nematode sex ratio in tertiary roots. Increased male to female ratios were attributed to differential death-rate of male and female larvae under conditions of food stress created by crowding. [A.S.] C.E.S.

-TRUSKOVA, G. M., 1972. [Description of a new species of *Anaplectus* (Nematoda, Plectidae), with a key to species of the genus.] *Zoologicheskii Zhurnal*, 51 (4), 594-596. [Ru, en] Biological-Soil Inst., Vladivostok, USSR.

Anaplectus intermedius n.sp. was found in the roots and rhizosphere of soybean in the Amur region (USSR). It is intermediate in morphology between *A. submersus* and *A. granulosus*. It differs from *A. submersus* in the shape of the gubernaculum and from *A. granulosus* in the structure of the lip region and the size of the first supplementary organ. The author considers that the principal diagnostic characters of the genus are the structure of the spicules and gubernaculum, the size of the first supplementary organ and the structure of the head end and, accordingly, gives a key to the 6 species of the genus. G.I.P.

ANNOTATED BIBLIOGRAPHIES

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The following bibliographies are obtainable from the
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103 St. Peter's Street, St. Albans, AL1 3EW, Herts, England.

- 1 *Cysticercus ovis* and *Taenia ovis*
59 references covering 1932-69. £0.50 (\$1.30)
- 2 *Taenia saginata* and *T. solium* in Lebanon, Turkey and Yugoslavia
50 references covering 1932-69. £0.50 (\$1.30)
- 3 Helminthology in Iraq
71 references covering 1932-69. £0.70 (\$1.80)
- 4 Humpsore (Stephanofilariasis) in domestic animals
71 references covering 1932-69. £0.70 (\$1.80)
- 5 Skin lesions in domestic animals caused by *Elaeophora*, *Rhabditis* & *Parafilaria*
55 references covering 1932-69. £0.50 (\$1.30)
- 6 Helminths and plant nematodes of Morocco
111 references covering 1932-70. £1.00 (\$2.60)
- 7 *Angiostrongylus*
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- 8 Factors influencing the development of *Ascaris* eggs
120 references covering 1932-71. £1.20 (\$3.10)
- 9 Helminths in archaeological and pre-historic deposits
32 references covering 1910-72. £0.50 (\$1.30)
- 10 Neurological involvement in *Trichinella spiralis* infection of man
51 references covering 1932-70. £0.60 (\$1.60)
- 11 White tip disease (*Aphelenchoides besseyi*) of rice in Africa and the tropics
150 references covering 1913-72. £2.40 (\$6.20)

Suggestions of topics suitable for future bibliographies will be welcomed.
Prices include postage by surface mail.